Public Scoping Comments – Regulatory Meeting

Appendix K

Los Angeles to San Diego via the Inland Empire Section

California High-Speed Train Project

Regulatory Agency Scoping Meeting

Thursday, October 15, 2009

9:00 a.m. - 12:00 noon

U.S. Fish and Wildlife Service

6010 Hidden Valley, Room 1

Carlsbad, California 92011

Reported by Anne M. Zarkos, RPR, CRR, CSR No. 13095

Comments by Meeting Attendees

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TAIT GALLOWAY: I'll just make a couple comments just as you consider going forward. I guess wherever possible -- and my comments are germane just to the City of San Diego. On the I-15 corridor and the I-5, to look at options, I understand some of the earlier discussions of I-15 was looking at an aerial structure, potentially looking at grade structure or below grade. I understand there's probably cost and right-of-way issues. But if that could be at least considered or evaluated as part of the environmental.

The other -- one of the other issues dealing with alignment is, as part of a working group and our discussions with the City of San Diego and High-Speed Rail team, was an option of looking at a route that went through University City that potentially could avoid using the Rose Canyon right-of-way and hooking up with Interstate 5.

And then likewise, as it goes down the I-5 corridor, the option of looking at different alignments both at grade, below, and aerial structures to minimize visual impacts would be welcome by the City.

I guess the other two are more questions. The other one is dealing with SB 375 and the work that the

local jurisdictions in the County of San Diego are working with SANDAG at the long range assumptions that we're making for 2050 to avoid the commute out of the region. So in other words, looking at how we would house our future population for 2050.

So this actually brings up an interesting thing I hadn't thought about before. A gentleman had made it during the presentation about future development happening outside in Greenfield Development. So essentially, that's what we had been assuming before. But now because of SB 375, we're assuming growth now is gonna happen within the region. So it kind of brings up an interesting scenario, I don't think one that's been thought of before, or at least hasn't been addressed as part of the SANDAG forecast process we're currently working on.

And then finally, I would just ask about land use compatibility and TOD development. Are you gonna be working with the jurisdictions in terms of what land use assumptions, or are you just going to assume what the current plans are in place that would be allowed? Basically, how are you gonna address that in the environmental document?

For the record, my name is Tait Galloway, and I'm with the City of San Diego City Planning and Use

Department.

MS. WILKINSON: We will address those questions. I know that for the land use, the way we're organizing ourselves is we're gonna be meeting with the different technical working groups. And SANDAG is in the process of forming the representatives that are gonna represent the individual jurisdictions for San Diego County. And so as working with that group, and it might be yourself or others from the City planning department, we're gonna be taking that information and incorporating it into the EIR/EIS.

But it does -- I do believe we are going to be required to look at existing and approved land uses when we do our evaluation. So it will depend on the timing of where you're at on your plan updates.

Any other comments, questions?

DEBBIE KNIGHT: My name is Debbie Knight. I'm executive director of Friends of Rose Canyon. And I've been doing this somewhat similar presentation at our planning group and also the previous scoping meetings in the past couple of days.

I would just like to mention that it's been made -- there's been very, very strong support in our community, certainly, and I think elsewhere, to study the I-15 to Qualcomm Row, which was in the program EIR.

It was -- had actually many advantages in the program EIR. It had better ridership. It had less impacts. It was shorter route. It was a quicker time, and I-15 to Qualcomm.

There were also options looking at going down from there to downtown but also ending at Qualcomm. And I think it's really important. I don't -- I'm not sure -- we've been assured at other meetings that there might be a chance to look at that.

The only reason it isn't listed here is because SANDAG and the City of San Diego had said they didn't want it considered. But it was certainly a very viable alternative based on the program EIR. And I would encourage the agencies here to also request that that be studied, because I think it's really a mistake to go forward with an alternative here through University City, potentially through the canyon, or the only way to avoid the canyon, massive tunneling, that you're looking at cost effectiveness and ridership are things that the agencies should request that the I-15 to Qualcomm be studied. Thank you.

MS. WILKINSON: Thank you.

TED ANASIS: I'm Ted Anasis with the San Diego County Regional Airport Authority, and I just have four comments.

The first is really related to the purpose and need in the document, primarily from -- just as a background, the Airport Authority operates San Diego International Airport, but it's also the land use compatibility planning agency or airport land use commission for San Diego County. And there is an airport land use compatibility plan that will be prepared for San Diego International Airport that guides land uses surrounding the airport, including safety and requirements.

So related to planning and land use, I would suggest that there be analysis or compatibility with the adopted airport master plan, the proposed airport use compatibility plan for San Diego International Airport and consistency with the destination Lindbergh multiagency planning effort, and specifically where the rail station he would connect to the -- to Lindbergh Field.

The second comment related to purpose and need is also just essentially collaboration and substantiation of the forecast for passenger demand, and just friendly advice to make sure that there's coordination amongst the assumptions and the technical analysis for the passenger demand.

More specifically related to the third comment

is related to operations. Around an airport there are federal aviation requirements and some safety and security concerns. So those should be thought through in terms of the proximity of the station to the airport.

And then finally, circulation, traffic and parking, there are local road and intersection challenges around an airport station or connection, the rail crossings, and then cooperation amongst parking facilities.

MS. WILKINSON: Thanks, Ted.

ANDY HAMILTON: I'm Andy Hamilton with the Air Pollution Control District for San Diego. And my comments are basically that the air quality analysis, I'm wondering how deep the analysis is gonna go.

There's the immediate impacts, and then there are the induced impacts, you know, within a couple of years. But then there's impacts within 10, 15, 20 years. And probably most of those will be positive, but not all of them. And I'm just -- my comment is, you know, of course at some point you have to cut off how much you're gonna study. But I'd be interested to see how that decision will be made.

There will be induced -- this facility is not like anything else we've cited. It's like an airport, but it's also like a train station for a conventional

train. And so I think we need to think of it very differently.

In my mind, this -- it provides an opportunity for the state to demonstrate best practices not only in terms of a, you know, a High-Speed Rail system but also in terms of the local streets and roads around and the urban design. And it would be good if, in addition to building this facility, there be some money provided to the local governments to do traffic calming, pedestrian and bicycle and transit access designing within, you know, a certain vicinity of the station so that they demonstrate best practice in those areas.

Because a lot of local governments would probably do those things but don't feel that like they can afford them. Or, you know, some of them don't really understand what best practice is, frankly. So it would be good to demonstrate some of those. So there will be safety issues with traffic, not just in the vicinity of the station but some ways away from them.

Traffic diversion from airports, and of course you're gonna be looking at the net air quality benefits from that. And from development, that will happen near the stations as opposed to, you know, 20 miles out in the back country. So there will be some relieving of development pressure by development in this area and,

you know, it would be good to know what those net impacts are.

The parking alternatives also presented a lot of interesting conundrums, because it's gonna take a lot of land or building upwards to provide the parking facilities to deal with these. And, you know, how far away can you build those and still have them serve the station in a way that's attractive for passengers for downtown San Diego. I don't think you have a lot of option, so it will be a huge coordination effort there. I'm not telling you anything you don't really know, I'm sure.

But I would be interested in the EIR looking at parking alternatives, not just with where and how they're provided but how they're managed. So what is the pricing on parking?

And in that way, you think of it like you'd think of an airport, whereas, you know, in other train station areas there's free parking. So I don't think free parking is a good idea for this facility. And how to manage that parking in a way that's used most effectively would be good.

And then there will be new transit services that are induced as a result. If you're looking at the net air quality benefits or net air quality impacts, I

think that should include what new transit services would be created to serve this station area, or will they be routes that are diverted from existing routes.

And then I applaud the idea that you're gonna provide urban design guidelines for the stations. That's terrific. And I hope there will be an opportunity to comment on those guidelines. And that's pretty much my comments.

MS. WILKINSON: Thank you. Veronica.

VERONICA CHAN: Veronica Chan with the Army Corps of Engineers. I just want to say that in addition to the 404 Clean Water Act requirements that you're considering, there's Section 408 for impacts to levies and flood control channels. And that's not with the regulatory division. That would be with our civil works and asset management division.

And they would need to go through and -- for impacts to federal property or land or, I guess, with federal interests involved, we need to go through our own process. So it would be good to involve, I guess, the entire Corps, I guess, regulatory and those other divisions as we go through the process so that we can eventually maybe adopt the document, if that's -- if we agree, if that's acceptable.

MS. WILKINSON: Any more comments? One more.

TAIT GALLOWAY: Andy brought up a good point. I just want to reiterate is that when we look at parking at the station, that is gonna be a huge issue for the City of San Diego, both in the University City area and downtown. And I would encourage the High-Speed Rail Authority to look at alternate transportation means using transit and other type measures to help reduce that parking demand and a number of trips to these facilities.

MS. WILKINSON: Okay. With that I think we're done with our presentation and formal comment. We are going to come back to you again. I will be the point of contact for setting up those future agency coordination meetings. So without any questions or you need to leave me your contact information, come see me.

And then we have some information that we're gonna distribute on disk to you, and I did hear a request for some information that's not on the disk, like the urban guidelines for the station. So we can either forward you the address on a website where they might have that, or we can try to get that to you on a separate disk.

MS. AVELLANO: Just for your reference, the website address is on this handout on the bottom, and there's actually a lot of information of the technical

document there from past work and the various guidelines that the Authority has prepared over time, tech memos. So I highly recommend you visiting that and poking around the different references. There's a lot of information there.

MALE SPEAKER: Is the presentation on the website?

MS. AVELLANO: The presentation as well is on the website, yes. Actually, or soon will be there. The PDF file was just done, and as we speak it may be posted.

MS. WILKINSON: Just a reminder, on this disk we do have purpose and need. We have a copy of the maps that we've got up here and the methodologies on the disk. Thank you.

(Whereupon the meeting was adjourned at 11:01 a.m.)

I, Anne M. Zarkos, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that any witnesses in the foregoing proceedings, prior to testifying, were duly sworn; that a record of the proceedings was made by me using machine shorthand which was thereafter transcribed under my direction; that the foregoing transcript is a true record of the testimony given.

Further, that if the foregoing pertains to the original transcript of a deposition in a Federal case, before completion of the proceedings, review of the transcript [ ] was [ ] was not requested.

IN WITNESS WHEREOF, I have this date subscribed my name.

Dated this_____day of_____, 2009, at San Diego, California.

_____

Anne M. Zarkos, RPR, CRR

CSR No. 13095

PUBLIC SCOPING MEETING

CALIFORNIA HIGH-SPEED TRAIN SYSTEM

LOS ANGELES TO SAN DIEGO VIA THE INLAND EMPIRE

THURSDAY OCTOBER 22, 2009

3:00 P.M. TO 7:00 P.M.

HELD AT

CESAR CHAVEZ COMMUNITY CENTER

2060 UNIVERSITY AVENUE

RIVERSIDE, CALIFORNIA

Pages 1 - 5

Comments by:

1. Judy Salazar
2. Steve Enna
3. Ned Ibrahim

RIVERSIDE, CALIFORNIA, THURSDAY OCTOBER 22, 2009,

MS. SALAZAR: I just want to say that the meeting is very interesting. I have been reading about it in the paper and following through with it. Resident of Riverside all my life. I would like to see it go along the corridor of the 215 free way. I prefer the 215.

MR. ENNA: Here are my comments on it.

Number 1, you're going to have to limit the stations. Otherwise you might as well build a Metrolink, because the whole purpose of a high-speed train is to have limited access so that you can go faster.

Second thing is if you do that, then you have to have light rail and buses to augment it so you can get the people from and to the high-speed train.

And third, I like the 215 option. It makes more sense: Easier to construct; the land is not impacted; there's a lot of open space. And it will be easier to control.

MR. IBRAHIM: I live in Riverside. I am a retired engineer. Was the Assistant Public Works Director for the City of Corona.

Obviously this is a tremendously important project for the State and for the region. Just looking

at the maps here without looking at all the details, because there are no details, the purple alignment, which is the I-10/215, the one that is through East Riverside seems to be positioned to serve where the most concentration of population and commerce and future growth for the western Riverside County is, and that would be my choice, without looking at the rest of the facts of course.

The station near UCR, in addition to the one by Cal Poly Pomona, are really critical. These are huge campuses, and obviously this kind of facility being a high speed facility, should really be looked at as an Interstate, as if it was a freeway. There shouldn't be too many stops. Otherwise it ceases to be an intrastate system. You cannot have a stop in every little town.

And certainly there would be opportunities. It's like when you build a new freeway. There will be opportunities to feed into the system through light rail or Metrolink in addition to the highway system.

But I am for the purple alignment that seems to be just positioned exactly where I think it needs to be in relation to the freeway system and the population, where the growth is for the County.

(end of comments)

STATE OF CALIFORNIA)
) ss.
COUNTY OF LOS ANGELES)

I, RUBEN GARCIA, CSR No. 11305, do hereby certify:

That the Transcript of Proceedings was taken down by me in shorthand at the time and place therein named, at which times the witnesses were placed under oath and were sworn by me to tell the truth, the whole truth, and nothing but the truth;

That the foregoing pages contain a full, true and accurate record of all proceedings and testimony to the best of my skill and ability.

I further certify that I am neither counsel for any party in said action, nor am I related to any party to said action, nor am I in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 30th day of October, 2009.

_____

RUBEN GARCIA, CSR No. 11305

Comment Form

CALIFORNIA HIGH-SPEED TRAIN SYSTEM
Los Angeles to San Diego via the Inland Empire Section

Thank you for attending today's meeting. The scoping process is designed to provide the public and governmental agencies the opportunity to help identify the scope of issues to be studied in depth during the preparation of the Environmental Impact Report/Environmental Impact Statement. Scoping allows the public to become involved at the beginning of the EIR/EIS process. Please take a few minutes to provide your comments. Please return comments to the California High-Speed Rail Authority by November 20, 2009 (return address is on the reverse side of this form).

Today's Meeting Date/Location: Carlsbad Regulatory Mtg.

☐ October 13 – La Jolla ☐ October 14 – San Diego ☒ October 15 – ~~Escondido~~ Carlsbad

Name (please print): Andy Hamilton City: San Diego State: CA Zip: 92131

Organization/Business APCD E-mail: andy.hamilton@sdcounty.ca.gov

Address:

☒ Yes, I would like to be added to your mailing list to receive newsletters, information mailings and meeting notices.

Comment (please write clearly):

- Induced pedestrian and bike trips outside of scoping area of stations, and safety issues (these presents, and traffic issues as well.
- Traffic diversion from airports, net air quality benefits.
- Traffic diversion from local roads and interstates, state highways, etc.
- Parking alternatives, including pricing / management alternatives.
- Likely induced new transit services - trips, person-trips, air quality impacts.
- Likely induced land development near stations, air quality impacts or benefits.

Opportunity to comment on the Urban Design Guidelines?

Santa Fe Depot –

Thank you for your participation in this important process. You may drop off your completed comment sheet in a comment box or with any High-Speed Train team member, mail, or send via e-mail with subject line "LA-SD HST Section via the Inland Empire" to comments@hsr.ca.gov. In addition, comments may also be submitted verbally to the court reporter today. All comments must be submitted no later than November 20, 2009.

Fold and Tape Completely Before Mailing

Linda S. Adams
Secretary for
Environmental Protection

California Regional Water Quality Control Board

San Diego Region

Over 50 Years Serving San Diego, Orange, and Riverside Counties
Recipient of the 2004 Environmental Award for Outstanding Achievement from USEPA

Arnold Schwarzenegger
Governor

9174 Sky Park Court, Suite 100, San Diego, California 92123-4353
(858) 467-2952 • Fax (858) 571-6972
http:// www.waterboards.ca.gov/sandiego

10/15 REC'D @ Carlsbad Regulatory Meeting

October 14, 2009

In reply refer to:
WPC: lpardy

Mr. Dan Leavitt
Deputy Director
California High Speed Rail Authority
925 L Street, Suite 1425
Sacramento, CA 95814

Dear Ms. Glasgow:

SUBJECT: INVITATION TO BECOME A PARTICIPATING AGENCY IN THE LOSSAN HIGH SPEED TRAIN PROJECT EIR/EIS

The California Regional Water Quality Control Board, San Diego (Regional Board) has received your Notice of Preparation (NOP) and September 30, 3009 invitation to serve as a participating agency in the development of the Project EIR/EIS for the California High-Speed Train from Los Angeles to San Diego (LOSSAN), via the Inland Empire, CA.

The Regional Board regulates discharges of wastes in order to protect the quality of waters of the State, broadly defined as"the chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affects its use."[1] Implementation of the proposed project is likely to result in a number of potential impacts to water quality, wetland & riparian resources.

Addressing the protection of water resources and quality in the early stages of project development offers the most cost effective strategy for reducing the physical impacts to on-site streams and wetlands and minimizing the potential impacts of pollutants in urban runoff from the site to downstream surface waters.

On behalf of the Regional Board, I accept your invitation and welcome the opportunity to work with you and other participating agencies to make this project an example of environmental sustainability in California.

I have assigned Linda Pardy of my staff to be the Regional Board point of contact for this process, and her contact information follows below:

[1] California Water Code, §13050.

Linda Pardy
Environmental Scientist
San Diego Regional Water Quality Control Board
Phone: (858) 627-3932
Fax: (858) 571-6972
e-mail: lpardy@waterboards.ca.gov

The heading portion of this letter includes a Regional Board code number noted after "In reply refer to:" In order to assist us in the processing of your correspondence please include this code number in the heading or subject line portion of all correspondence and reports to the Regional Board pertaining to this matter.

Respectfully,

JOHN H. ROBERTUS
Executive Officer

JHR:dtb:cc

cc:

Ms. Kelly Finn
Environmental Analysis Branch Chief
Caltrans District 11, M.S.-242
4050 Taylor Street
San Diego, CA 92110

Ms. Susanne Glasgow
Deputy District Director, Environmental
Caltrans, District 11, MS-242
4050 Taylor Street
San Diego, CA 92110

Ms. Deborah Bourgeois (By Email)
Assistant to Board Chair
State Water Resources Control Board

Los Angeles to San Diego via the Inland Empire Section

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MS. WILKINSON: Just a reminder, on this disk we do have purpose and need. We have a copy of the maps that we've got up here and the methodologies on the disk. Thank you.

(Whereupon the meeting was adjourned at 11:01 a.m.)

I, Anne M. Zarkos, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that any witnesses in the foregoing proceedings, prior to testifying, were duly sworn; that a record of the proceedings was made by me using machine shorthand which was thereafter transcribed under my direction; that the foregoing transcript is a true record of the testimony given.

Further, that if the foregoing pertains to the original transcript of a deposition in a Federal case, before completion of the proceedings, review of the transcript [ ] was [ ] was not requested.

IN WITNESS WHEREOF, I have this date subscribed my name.

Dated this_____day of_____, 2009, at San Diego, California.

_____

Anne M. Zarkos, RPR, CRR

CSR No. 13095

PUBLIC SCOPING MEETING

CALIFORNIA HIGH-SPEED TRAIN SYSTEM

LOS ANGELES TO SAN DIEGO VIA THE INLAND EMPIRE

THURSDAY OCTOBER 22, 2009

3:00 P.M. TO 7:00 P.M.

HELD AT

CESAR CHAVEZ COMMUNITY CENTER

2060 UNIVERSITY AVENUE

RIVERSIDE, CALIFORNIA

Pages 1 - 5

Comments by:

1. Judy Salazar
2. Steve Enna
3. Ned Ibrahim

RIVERSIDE, CALIFORNIA, THURSDAY OCTOBER 22, 2009,

MS. SALAZAR: I just want to say that the meeting is very interesting. I have been reading about it in the paper and following through with it. Resident of Riverside all my life. I would like to see it go along the corridor of the 215 free way. I prefer the 215.

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Number 1, you're going to have to limit the stations. Otherwise you might as well build a Metrolink, because the whole purpose of a high-speed train is to have limited access so that you can go faster.

Second thing is if you do that, then you have to have light rail and buses to augment it so you can get the people from and to the high-speed train.

And third, I like the 215 option. It makes more sense: Easier to construct; the land is not impacted; there's a lot of open space. And it will be easier to control.

MR. IBRAHIM: I live in Riverside. I am a retired engineer. Was the Assistant Public Works Director for the City of Corona.

Obviously this is a tremendously important project for the State and for the region. Just looking

at the maps here without looking at all the details, because there are no details, the purple alignment, which is the I-10/215, the one that is through East Riverside seems to be positioned to serve where the most concentration of population and commerce and future growth for the western Riverside County is, and that would be my choice, without looking at the rest of the facts of course.

The station near UCR, in addition to the one by Cal Poly Pomona, are really critical. These are huge campuses, and obviously this kind of facility being a high speed facility, should really be looked at as an Interstate, as if it was a freeway. There shouldn't be too many stops. Otherwise it ceases to be an intrastate system. You cannot have a stop in every little town.

And certainly there would be opportunities. It's like when you build a new freeway. There will be opportunities to feed into the system through light rail or Metrolink in addition to the highway system.

But I am for the purple alignment that seems to be just positioned exactly where I think it needs to be in relation to the freeway system and the population, where the growth is for the County.

(end of comments)

STATE OF CALIFORNIA)
) ss.
COUNTY OF LOS ANGELES)

I, RUBEN GARCIA, CSR No. 11305, do hereby certify:

That the Transcript of Proceedings was taken down by me in shorthand at the time and place therein named, at which times the witnesses were placed under oath and were sworn by me to tell the truth, the whole truth, and nothing but the truth;

That the foregoing pages contain a full, true and accurate record of all proceedings and testimony to the best of my skill and ability.

I further certify that I am neither counsel for any party in said action, nor am I related to any party to said action, nor am I in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 30th day of October, 2009.

_____

RUBEN GARCIA, CSR No. 11305

Los Angeles to San Diego via the Inland Empire Section

California High-Speed Train Project

Regulatory Agency Scoping Meeting

Thursday, October 15, 2009

9:00 a.m. - 12:00 noon

U.S. Fish and Wildlife Service

6010 Hidden Valley, Room 1

Carlsbad, California 92011

Reported by Anne M. Zarkos, RPR, CRR, CSR No. 13095

Comments by Meeting Attendees

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TAIT GALLOWAY: I'll just make a couple comments just as you consider going forward. I guess wherever possible -- and my comments are germane just to the City of San Diego. On the I-15 corridor and the I-5, to look at options, I understand some of the earlier discussions of I-15 was looking at an aerial structure, potentially looking at grade structure or below grade. I understand there's probably cost and right-of-way issues. But if that could be at least considered or evaluated as part of the environmental.

The other -- one of the other issues dealing with alignment is, as part of a working group and our discussions with the City of San Diego and High-Speed Rail team, was an option of looking at a route that went through University City that potentially could avoid using the Rose Canyon right-of-way and hooking up with Interstate 5.

And then likewise, as it goes down the I-5 corridor, the option of looking at different alignments both at grade, below, and aerial structures to minimize visual impacts would be welcome by the City.

I guess the other two are more questions. The other one is dealing with SB 375 and the work that the

local jurisdictions in the County of San Diego are working with SANDAG at the long range assumptions that we're making for 2050 to avoid the commute out of the region. So in other words, looking at how we would house our future population for 2050.

So this actually brings up an interesting thing I hadn't thought about before. A gentleman had made it during the presentation about future development happening outside in Greenfield Development. So essentially, that's what we had been assuming before. But now because of SB 375, we're assuming growth now is gonna happen within the region. So it kind of brings up an interesting scenario, I don't think one that's been thought of before, or at least hasn't been addressed as part of the SANDAG forecast process we're currently working on.

And then finally, I would just ask about land use compatibility and TOD development. Are you gonna be working with the jurisdictions in terms of what land use assumptions, or are you just going to assume what the current plans are in place that would be allowed? Basically, how are you gonna address that in the environmental document?

For the record, my name is Tait Galloway, and I'm with the City of San Diego City Planning and Use

Department.

MS. WILKINSON: We will address those questions. I know that for the land use, the way we're organizing ourselves is we're gonna be meeting with the different technical working groups. And SANDAG is in the process of forming the representatives that are gonna represent the individual jurisdictions for San Diego County. And so as working with that group, and it might be yourself or others from the City planning department, we're gonna be taking that information and incorporating it into the EIR/EIS.

But it does -- I do believe we are going to be required to look at existing and approved land uses when we do our evaluation. So it will depend on the timing of where you're at on your plan updates.

Any other comments, questions?

DEBBIE KNIGHT: My name is Debbie Knight. I'm executive director of Friends of Rose Canyon. And I've been doing this somewhat similar presentation at our planning group and also the previous scoping meetings in the past couple of days.

I would just like to mention that it's been made -- there's been very, very strong support in our community, certainly, and I think elsewhere, to study the I-15 to Qualcomm Row, which was in the program EIR.

It was -- had actually many advantages in the program EIR. It had better ridership. It had less impacts. It was shorter route. It was a quicker time, and I-15 to Qualcomm.

There were also options looking at going down from there to downtown but also ending at Qualcomm. And I think it's really important. I don't -- I'm not sure -- we've been assured at other meetings that there might be a chance to look at that.

The only reason it isn't listed here is because SANDAG and the City of San Diego had said they didn't want it considered. But it was certainly a very viable alternative based on the program EIR. And I would encourage the agencies here to also request that that be studied, because I think it's really a mistake to go forward with an alternative here through University City, potentially through the canyon, or the only way to avoid the canyon, massive tunneling, that you're looking at cost effectiveness and ridership are things that the agencies should request that the I-15 to Qualcomm be studied. Thank you.

MS. WILKINSON: Thank you.

TED ANASIS: I'm Ted Anasis with the San Diego County Regional Airport Authority, and I just have four comments.

The first is really related to the purpose and need in the document, primarily from -- just as a background, the Airport Authority operates San Diego International Airport, but it's also the land use compatibility planning agency or airport land use commission for San Diego County. And there is an airport land use compatibility plan that will be prepared for San Diego International Airport that guides land uses surrounding the airport, including safety and requirements.

So related to planning and land use, I would suggest that there be analysis or compatibility with the adopted airport master plan, the proposed airport use compatibility plan for San Diego International Airport and consistency with the destination Lindbergh multiagency planning effort, and specifically where the rail station he would connect to the -- to Lindbergh Field.

The second comment related to purpose and need is also just essentially collaboration and substantiation of the forecast for passenger demand, and just friendly advice to make sure that there's coordination amongst the assumptions and the technical analysis for the passenger demand.

More specifically related to the third comment

is related to operations. Around an airport there are federal aviation requirements and some safety and security concerns. So those should be thought through in terms of the proximity of the station to the airport.

And then finally, circulation, traffic and parking, there are local road and intersection challenges around an airport station or connection, the rail crossings, and then cooperation amongst parking facilities.

MS. WILKINSON: Thanks, Ted.

ANDY HAMILTON: I'm Andy Hamilton with the Air Pollution Control District for San Diego. And my comments are basically that the air quality analysis, I'm wondering how deep the analysis is gonna go.

There's the immediate impacts, and then there are the induced impacts, you know, within a couple of years. But then there's impacts within 10, 15, 20 years. And probably most of those will be positive, but not all of them. And I'm just -- my comment is, you know, of course at some point you have to cut off how much you're gonna study. But I'd be interested to see how that decision will be made.

There will be induced -- this facility is not like anything else we've cited. It's like an airport, but it's also like a train station for a conventional

train. And so I think we need to think of it very differently.

In my mind, this -- it provides an opportunity for the state to demonstrate best practices not only in terms of a, you know, a High-Speed Rail system but also in terms of the local streets and roads around and the urban design. And it would be good if, in addition to building this facility, there be some money provided to the local governments to do traffic calming, pedestrian and bicycle and transit access designing within, you know, a certain vicinity of the station so that they demonstrate best practice in those areas.

Because a lot of local governments would probably do those things but don't feel that like they can afford them. Or, you know, some of them don't really understand what best practice is, frankly. So it would be good to demonstrate some of those. So there will be safety issues with traffic, not just in the vicinity of the station but some ways away from them.

Traffic diversion from airports, and of course you're gonna be looking at the net air quality benefits from that. And from development, that will happen near the stations as opposed to, you know, 20 miles out in the back country. So there will be some relieving of development pressure by development in this area and,

you know, it would be good to know what those net impacts are.

The parking alternatives also presented a lot of interesting conundrums, because it's gonna take a lot of land or building upwards to provide the parking facilities to deal with these. And, you know, how far away can you build those and still have them serve the station in a way that's attractive for passengers for downtown San Diego. I don't think you have a lot of option, so it will be a huge coordination effort there. I'm not telling you anything you don't really know, I'm sure.

But I would be interested in the EIR looking at parking alternatives, not just with where and how they're provided but how they're managed. So what is the pricing on parking?

And in that way, you think of it like you'd think of an airport, whereas, you know, in other train station areas there's free parking. So I don't think free parking is a good idea for this facility. And how to manage that parking in a way that's used most effectively would be good.

And then there will be new transit services that are induced as a result. If you're looking at the net air quality benefits or net air quality impacts, I

think that should include what new transit services would be created to serve this station area, or will they be routes that are diverted from existing routes.

And then I applaud the idea that you're gonna provide urban design guidelines for the stations. That's terrific. And I hope there will be an opportunity to comment on those guidelines. And that's pretty much my comments.

MS. WILKINSON: Thank you. Veronica.

VERONICA CHAN: Veronica Chan with the Army Corps of Engineers. I just want to say that in addition to the 404 Clean Water Act requirements that you're considering, there's Section 408 for impacts to levies and flood control channels. And that's not with the regulatory division. That would be with our civil works and asset management division.

And they would need to go through and -- for impacts to federal property or land or, I guess, with federal interests involved, we need to go through our own process. So it would be good to involve, I guess, the entire Corps, I guess, regulatory and those other divisions as we go through the process so that we can eventually maybe adopt the document, if that's -- if we agree, if that's acceptable.

MS. WILKINSON: Any more comments? One more.

TAIT GALLOWAY: Andy brought up a good point. I just want to reiterate is that when we look at parking at the station, that is gonna be a huge issue for the City of San Diego, both in the University City area and downtown. And I would encourage the High-Speed Rail Authority to look at alternate transportation means using transit and other type measures to help reduce that parking demand and a number of trips to these facilities.

MS. WILKINSON: Okay. With that I think we're done with our presentation and formal comment. We are going to come back to you again. I will be the point of contact for setting up those future agency coordination meetings. So without any questions or you need to leave me your contact information, come see me.

And then we have some information that we're gonna distribute on disk to you, and I did hear a request for some information that's not on the disk, like the urban guidelines for the station. So we can either forward you the address on a website where they might have that, or we can try to get that to you on a separate disk.

MS. AVELLANO: Just for your reference, the website address is on this handout on the bottom, and there's actually a lot of information of the technical

document there from past work and the various guidelines that the Authority has prepared over time, tech memos. So I highly recommend you visiting that and poking around the different references. There's a lot of information there.

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(end of comments)

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RUBEN GARCIA, CSR No. 11305

Friends of Rose Canyon Comments Re High-Speed Rail NOP
November 20, 2009

Friends of Rose Canyon
PO Box 221051
San Diego CA 92192-1051
858-597-0220 rosecanyon@san.rr.com
www.rosecanyon.org

Via Email and U.S. Mail

November 20, 2009

Mr. Dan Leavitt, Deputy Director
California High-Speed Rail Authority
925 L Street, Suite 1425
Sacramento, CA 95814

Re: LA-SD HST Section via the Inland Empire

Dear Mr. Leavitt:

Friends of Rose Canyon appreciates the opportunity to comment on the proposed High-Speed Rail project. Our organization's mission is to protect, preserve and restore Rose Canyon and the Rose Creek watershed. The Rose Creek watershed is an important coastal watershed that extends from its upper reaches on Marine Corp Base Miramar through Rose Canyon and San Clemente Canyon and along Rose Creek south to Mission Bay. The proposed alignment through Rose Canyon and south of SR-52 along Marion Bear Park and Rose Creek is of grave concern to us.

1. The EIR/EIS should study the cumulative impacts of any proposed high-speed rail alignment on Rose Canyon, Rose Creek and the Rose Creek watershed in relation to past, present and future projects, including, but not limited to the following:

- All SANDAG's potential Midcoast Corridor projects (LRT, expanded coaster service, additional heavy rail tracks, or any other alternatives) along Rose Creek south of SR-52 and north of SR-52 through Rose Canyon.
- The proposed Regents Road bridge project (see Attachments for comment letters on a number of environmental issues related to Rose Canyon)
- The City of San Diego's Metropolitan Wastewater Department's 2007 Miramar trunk sewer project
- The Metropolitan Wastewater Department's current wetland and upland mitigation project in Rose Canyon.
- Sewer access paths proposed by the City of San Diego's Metropolitan Wastewater Department
- Current and proposed storm water maintenance activities, including access roads. This should include activities proposed in the City of San Diego's soon-to-be-released Master Storm Water System Maintenance Program Final Program EIR.

- Habitat fragmentation, including the impact on wildlife in San Diego canyons (see Attachments for research by Kevin Crooks)
- New development anticipated by or associated with the HSR project and with any of the above projects
- MSCP areas along the alignment

The cumulative impacts analysis should include the direct and indirect impacts of construction and maintenance activities for the HSR project and all of the above projects.

The cumulative impacts analysis in the EIR/EIS should comprehensively study the following impacts in relation to all of the above projects, including: biology, hydrology, wetlands, water quality, landform alteration, retaining walls, wildlife movement and wildlife corridor impacts, the MSCP, noise, vibrations, visual and aesthetic impacts, sensitive and threatened and endangered species, existing and future recreational and educational uses of Rose Canyon Open Space Park, Marion Bear Park, and Rose Creek (including the Rose Creek bikeway), impacts on the Rose Creek watershed (including Mission Bay), archeological and cultural impacts, and neighborhood character. The discussion of wildlife movement should include the loss or degradation of habitat, the impact of structures such as retaining walls and fencing, and indirect impacts such as noise and lights.

2. The EIR/EIS should study any proposed High-Speed Rail alignment's direct and indirect impacts on the Metropolitan Wastewater Department's current wetland and upland mitigation project in Rose Canyon.

3. The EIR/EIS should discuss any proposed High-Speed Rail alignment's compatibility with the MSCP and the direct and indirect impacts on the MSCP areas in Carroll Canyon, Rose Canyon and San Clemente Canyon (Marion Bear Memorial Park). The Program EIR failed to identify these areas as being in the MSCP, failed to identify compatibility with the MSCP and impacts on the MSCP as an issue, and failed even to make any mention of the MSCP.

4. The EIR/EIS should study all direct and indirect impacts on Rose Canyon Open Space Park, Marion Bear Memorial Park, and Rose Creek (including the Rose Creek bike path). The HSR Program EIR states: "Parks are generally not compatible with rail projects of this type due to the probability of noise impacts, visual impacts, and other potential direct and indirect impacts." (Los Angeles to San Diego via Inland Empire Land Use Technical Evaluation)
The City of San Diego's Open Space Parks webpage states: "Open Space within the City of San Diego is defined as areas generally free from development or developed with low intensity uses that respect natural environmental characteristics. Open Space Parks are used for purposes such as preservation of natural resources, passive outdoor recreation and scenic and visual enjoyment."

5. The EIR/EIS should study all direct and indirect impacts on the Rose Creek watershed, including those potential impacts listed under the cumulative impacts comment above.

6. The EIR/EIS should study the impacts on recreational and educational uses of Rose Canyon, Marion Bear Park, Rose Creek and the Rose Creek watershed.

7. The EIR should study the compatibility of the alignment through Rose Canyon with the following:

- University Community Plan
- Rose Creek Watershed Opportunities Assessment
- City of San Diego General Plan

8. The EIR should study the need for and direct and indirect impacts of modifications to all bridges and freeway intersections along the proposed alignment through Rose Canyon and along Rose Creek.

Alternatives Analysis

9. The Alternatives Analysis should state clearly that the CAHSRA's previous "preferred alternative" from Mira Mesa to San Diego through Rose Canyon based on the Program EIR is no longer the preferred alternative, and that there is no preferred alternative from Mira Mesa to San Diego. At the University Community Planning Group (UCPG) meeting on November 10, 2009, Mike Zdon, Project Manager for the LA-SD HSR section stated repeatedly to the large number of attendees: "There is no longer any preferred alignment." He further stated that a number of possible alignments that continued down the I-15 would be studied.

10. The Alternatives Analysis should eliminate any alignment through Rose Canyon for the following reasons:

A. The alignment through Rose Canyon should be eliminated for the same reasons the Program EIR Alternatives Analysis eliminated the "I-15 to Coast via SR 52" alignment. The Program EIR eliminated the SR-52 alignment for the following reasons:

- The alignment is long
- Considerable curves would reduce the potential average speed to 106 mph
- A constrained right-of-way in a densely developed area would make the this option impracticable
- The alignment would cross a high school, residential areas and Marion Bear Park along SR-52

These same reasons apply to the alignment via Carroll Canyon or Miramar Road and through Rose Canyon:

- The alignment is long
- Considerable curves would reduce the average speed to 93 mph using the Miramar Road alignment, 91 mph using the Carroll Canyon alignment
- The alignment crosses residential areas and has a constrained right-of-way
- The high school referred to as being along the SR-52 alignment (presumably University City High School) is adjacent actually adjacent to Rose Canyon (an error in the Program EIR)
- Rose Canyon contains Rose Canyon Open Space Park. The failure to identify this park's existence was a glaring error in the Program EIR. Marion Bear Memorial Park, Rose Canyon Open Space Park and Tecolote Canyon Natural Park are collectively known as the Tri-canyon Parks, with park rangers assigned to them.

B. The alignment through Rose Canyon should be eliminated because, as the Program EIR states: "Parks are generally not compatible with rail projects of this type due to the probability of noise impacts, visual impacts, and other potential direct and indirect impacts." (Los Angeles to San Diego via Inland Empire Land Use Technical Evaluation, p. 37.) The alignment through Rose Canyon would severely degrade the entire Rose Canyon Open Space Park. The park is a long, fairly narrow canyon. The HSR project would be clearly visible and audible from everywhere in the park. The project would require major grading and retaining walls. The 2008 Business Plan states there would be 134 trains per day (7-8 per hour each direction during the 6-9 am and 4-7 pm peak hours). The entire park would be within the 1,000' study area for indirect biological impacts.

11. The EIR/EIS should study the I-15 route to Qualcomm Stadium station alignment. The Program EIR stated there would be 350,000 more inter-city passengers a year at the Qualcomm Stadium terminus versus Santa Fe depot terminus. Qualcomm would provide a multi-modal transit location with the trolley and buses, is close to a number of major highways, and is centrally located within the metropolitan area. Furthermore, SANDAG supports a potential extension of HSR to the border by Rodriguez Airport. An extension to Rodriguez from Qualcomm Stadium would potentially be far straighter, faster, less expensive and more feasible than one that goes to Lindbergh and or downtown San Diego.

12. The EIR/EIS should study the alignment I-15 to SR-163 to Lindbergh or Downtown. The Program EIR found this alignment to have a number of advantages, including a fast travel time, fewer alignment curves, and an average speed of 141 mph. It stated the alternative was impracticable in part due to the need for two 1.5 mile tunnels. However, SANDAG has changed their recommended terminus from downtown to Lindbergh Field. Terminating at Lindbergh instead of downtown would require less tunneling.

13. The EIR/EIS should study the alignment I-15 to SR 163 to I-8 to Coast. This alignment was eliminated in the Program EIR. However, it should be considered on its own or in combination with a tunnel option.

14. The Alternatives Analysis should do a full analysis of both Lindbergh and Qualcomm Stadium alternatives for the terminal station. The Program EIR found significant advantages to the I-15 route to a terminal station at Qualcomm Station. It did not analyze Lindbergh, and the Airport Authority specifically requested there NOT be a station at Lindbergh. SANDAG has now changed their recommended terminal station from Santa Fe Depot to Lindbergh. In order to understand the pros and cons of Lindbergh and Qualcomm, it is important that the two receive an equal level of analysis. This should include the implications of either station for SANDAG's interest in a potential extension of High-Speed Rail to the border at Rodriguez Airport.

Sincerely,

Deborah Knight
Executive Director

Attachments: (emailed separately)

Comment letters submitted on the Draft and Final University City North/South Transportation Corridor Study EIR

1. USFWS/CDFG comment letter on the Draft EIR
2. Regional Water Quality Control Board comment letter on the Draft EIR
3. Conservation Biology Institute comment letter on the Final EIR
4. Vince Scheidt: Biology comment letter on the Draft EIR
5. Richard Rodkin: Noise comment letter on the Draft EIR

Kevin R. Crooks: Research studies on the impacts on wildlife of habitat fragmentation in San Diego canyons

6. Relative Sensitivities of Mammalian Carnivores to Habitat Fragmentation
7. Mesopredator release and avifaunal extinctions in a fragmented system
8. Extinction and Colonization of Birds on Habitat Islands

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009
(760) 431-9440
FAX (760) 431-5902 · 9618

CA Dept. of Fish & Game
South Coast Regional Office
4949 Viewridge Avenue
San Diego, California 92123
(858) 467-4201
FAX (858) 467-4299

In Reply Refer To:
FWS-SDG-3970.1

Martha Blake, Associate Planner
City of San Diego
Development Services Center
Land Development Review Division
1222 First Avenue, MS 501
San Diego, CA 92101

APR 15 2004

Re: Comments on the Notice of Preparation of a Draft Environmental Impact Report for the University City North/South Transportation Corridor Study (SCH# 2004031011)

Dear Ms. Blake:

The U.S. Fish and Wildlife Service (Service) and the California Department of Fish and Game (Department), collectively the "Wildlife Agencies," have received (on March 30, 2004, and March 3, 2004, respectively) and reviewed the Notice of Preparation (NOP) of a draft Environmental Impact Report (DEIR) for the University City North/South Transportation Corridor Study, and the February 27, 2004, memorandum from the City of San Diego's (City) Development Service's Department to the City's Engineering and Capital Improvements Department regarding the Study (City's memo). We also attended the City's December 9, 2003, pre-application meeting on the proposed project. Because the Service did not receive the NOP until March 30, 2004, the City granted us an extension of the public comment period, until April 16, 2004 (pers. comm., electronic mail from Martha Blake, March 30, 2004). We appreciate the extension, and assume that the City will fully consider our comments in the preparation of the DEIR.

The NOP indicates that the DEIR will describe and analyze six alternatives. These are: (1) Regents Road Bridge; (2) Genesee Avenue Widening; (3) Genesee Avenue/Governor Drive Grade Separation; (4) a combination of both the Regents Road Bridge and the Genesee Avenue widening without grade separation; (5) a combination of both the Regents Road Bridge and the Genesee Avenue widening with the grade separation; and (6) No Project which assumes the implementation of only the transit improvements planned as part of the Revenue-Constrained Scenario of SANDAG's Regional Transportation Plan. The Regents Road Bridge would extend across Rose Canyon to connect the existing termini of that street at the north and south rims of the canyon. The Genesee Avenue widening alternative would expand this roadway to six lanes between State Route (SR) 52 and Nobel Drive. The Genesee Avenue/Governor Drive Grade Separation would reconstruct the present intersection of these two streets to create an underpass beneath Governor Drive to accommodate through traffic on Genesee Avenue. The first three

alternatives would include the construction of a second left-hand turn lane along south bound Genesee Avenue to east bound SR 52. Alternatives 4 and 5 would include modifications at Genesee Avenue/SR 52. The DEIR would not recommend one alternative over another, but would provide a full analysis of each, and would identify the least environmentally damaging project alternative (LEDPA). The City Council would select an alternative for implementation (either one of the 'project' alternatives or the 'no project' alternative) when they consider the EIR for certification.

Portions of the study area are within the Multiple Habitat Preservation Area (MHPA) of the City's Multiple Species Conservation Program (MSCP) Subarea Plan. Specifically, these are (1) Rose Canyon (Rose Canyon Open Space Park) which would be affected by the Regents Road Bridge and the widening of Genesee Avenue, and (2) San Clemente Canyon (Marian Bear Memorial Natural Park), which would be affected by the widening of Genesee Avenue, and the modifications along south bound Genesee Avenue at east bound SR 52.

In summary, the DEIR should adequately demonstrate the purpose and need of the proposed project, if and how each project alternative will fulfill the project's purpose and need, and adequately describe how each alternative will impact biological resources and mitigate for those impacts. We offer the following comments to assist the City in avoiding, minimizing and mitigating project impacts to biological resources.

Project Purpose, Alternatives, and the LEDPA

1. The Wildlife Agencies are concerned about the potential impacts of the alternatives on the MHPA. We are interested in knowing which alternative would most avoid or minimize the biological impacts within and adjacent to the MHPA and meet the needs of the project. In order for us and other reviewers to make this assessment, it is important that the DEIR provide the following.

    a. The DEIR should include "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project [on the MHPA], and evaluate the comparative merits of the alternatives," as required by Section 15126.6 (a) of the CEQA Guidelines. The alternatives should be limited to ones that would avoid or substantially lessen any of the significant effects of the project [CEQA Guidelines, section 15126.6(f)]. For each alternative, the DEIR should provide a discussion on how each alternative would avoid or minimize significant impacts on biological resources.

    b. DEIR should provide a very clear and detailed description of the purpose, goals, and objectives for the project, as this will be critical in determining the most appropriate alternative to address the specific traffic needs and reduce biological impacts to a level less than significant. We recommend that the transportation/circulation analysis include a

table summarizing the positive and negative effects on traffic within the alternatives' respective areas of potential effect.[1]

2. Based on the December 9, 2003, meeting, we understand that the Regents Road Bridge alternative would affect an area of habitat (e.g., CSS, wetland) restoration in Rose Canyon between the mainstem of Rose Creek and the southern terminus of Regents Road. This area is within the MHPA. Furthermore, the City committed to preserving the restoration area in perpetuity by accepting funding from the California Department of Parks and Recreation (DPR) Habitat Conservation Fund Program (HCFP) to conduct the restoration. The DPR's procedural guide for the HCFP (May 1997), states, "applicant will maintain and operate the property acquired, developed, rehabilitated, or restored with the funds in perpetuity..... [and] make no other use, sale, or other disposition of the property except as authorized by specific act of the Legislature." The City's October, 1997, application to the DPR HCFP for funding this restoration, states, "all projects are within the protected boundaries of Rose Canyon Open Space Park," in response to a query about whether adjacent land use is permanent and compatible or adequate buffer zones would be established. The DEIR should briefly discuss the purpose of the restoration, and identify the City's commitments to the agency(ies) that awarded the City funding for it. If the City committed to preserving the restoration in perpetuity, and the Regents Road Bridge alternative could not be designed to avoid (including shading and indirect impacts) the restoration area, the DEIR should explain why the Regents Road Bridge is among the alternatives being studied.

3. We understand that the City's proposed LEDPA is unrelated to the LEDPA under section 404 of the Clean Water Act (pers. comm., Martha Blake, 4/12/04). To enable reviewers to fully understand how the LEDPA is determined, we recommend that the DEIR:

   a. identify and thoroughly describe the criteria used to determine the LEDPA (LEDPA criteria); there should be separate criteria for each issue area (e.g., Landform Alteration/Visual Quality," "Traffic/Circulation," "Biological Resources");

   b. explain the reasoning for each alternative's ranking in each LEDPA criterion;

   c. describe why the LEDPA, irrespective of other alternatives to the project, is consistent with and appropriate in the context of the MSCP Subarea Plan; and

   d. contain a matrix that summarizes each of the alternative's rankings in each of the LEDPA criteria.

4. The LEDPA criteria should encompass the issues identified by section 15126.6(f)(1) of the CEQA Guidelines which states, "Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional

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1 The DEIR should identify and provide the purpose and a brief description of each of the transit improvements planned as part of the Revenue-Constrained Scenario of SANDAG's Regional Transportation Plan, within the study areas for each of the alternatives.

boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent)." As to economic viability, the DEIR should identify the cost of each alternative, including the estimated cost of all mitigation that would be required (see comment #15).

Impact Analysis

5. The DEIR should address how the MSCP Subarea Plan and associated Implementing Agreement (IA) influences the following issue areas: "Land Use," "Landform Alteration/Visual Quality," "Traffic/Circulation," "Biological Resources," "Drainage/Urban Runoff/Water Quality," "Noise," "Growth Inducement" and "Cumulative Effects."

6. The DEIR must ensure and verify that the implementation of any of the alternatives would meet all the requirements and conditions of the City's MSCP Subarea Plan and IA. The DEIR should also address biological issues that are not addressed in the MSCP Subarea Plan and IA, such as specific impacts to and mitigation for wetlands or sensitive species and habitats that are not covered by the Subarea Plan and IA. For example, the DEIR should address whether any potential take of MSCP-covered species [e.g., coastal California gnatcatcher (*Polioptila californica californica*, gnatcatcher) and the least Bell's vireo (*Vireo bellii pusillus*, vireo)] would be in conformance with the MSCP.

7. The City's memo states, "at the time that the project is proposed for construction, development, and/or a community plan amendment, further project review would occur and any required permits would be sought. This would include further public involvement, review, and would be subject to further public hearings." We assume that "further project review" does not refer to additional CEQA documentation, and that the DEIR will provide an impact analyses for each of the alternatives that is sufficiently thorough for reviewers to provide informed comments and for the City Council to make a fully informed decision. Please clarify whether additional CEQA documentation would be prepared.

8. For each alternative's area of potential effect (APE), the DEIR should identify the listed species, California Species of Special Concern, and all other sensitive species for which the habitat within the APE is suitable. In addition, the DEIR should identify species observed during current (i.e., within a year of circulation of the DEIR) focused surveys (protocol-level surveys for species for which there is a protocol) conducted within the APEs.

9. The DEIR should analyze potential habitat fragmentation within the MHPA that would result from the implementation of each alternative, and the impacts of the fragmentation on the MSCP covered and non-covered species.

10. The DEIR should thoroughly analyze the potential impacts from the implementation of each alternative on wildlife corridors/linkages and wildlife movement within each alternative's APE. For example, the fill and bridge proposed in Rose Canyon for the Regents Road Bridge alternative may be detrimental to local wildlife movement.

a. The MSCP Subarea Plan states, "If roads cross the MHPA, they should provide fully-functional wildlife movement capability." The DEIR should address this requirement for each alternative, and should describe how the current level of wildlife movement in Rose Canyon and San Clemente Canyon and under Genesee Avenue would be retained or improved. Specifically, (a) for the widening of Genesee Avenue at Rose Canyon, the DEIR should describe how the box culverts under Genesee Avenue, which are already quite long, would be improved for wildlife movement,[2] and (b) the design for the Regents Road Bridge alternative should span the mainstem of Rose Canyon and the finger canyon between the mainstem and the southern terminus of Regents Road. The discussion of measures to improve the box culverts should include measures to attenuate noise from traffic.

b. The cumulative impacts analysis in the DEIR should comprehensively discuss the issue of wildlife movement, and the potential impacts from the implementation of any of the project alternatives in conjunction with past, present, and future projects within the APE.

c. The discussion of impacts on wildlife movement should encompass the direct impacts from loss of habitat and the installation of structures and from indirect impacts such as operational noise and lighting. We recommend that the design for the Regents Road Bridge, and the portions of the Genesee Avenue widening alternative that cross over Rose Canyon and San Clemente Canyon: (i) include minimal street lighting; (ii) include measures to prevent spill-over or glare from vehicle lights into the canyons or the night sky; and (iii) include measures to attenuate the noise from traffic.

d. If necessary to ascertain the potential impacts on wildlife movement and to assist in determining appropriate measures to avoid or minimize these impacts, the City should conduct a wildlife movement study. The Wildlife Agencies would appreciate the opportunity to review the scope of work developed for any study the City plans to conduct. If no such study is done, the DEIR should demonstrate that the information used for the impact analysis is adequate.

11. The DEIR should identify and discuss potential impacts to mitigation areas for previous projects.

12. In addition to the loss of sensitive habitat and the wildlife impacts associated with each alternative, the DEIR should also identify and provide a thorough analysis of the following for each alternative: (a) the sensitive habitat that would receive more or less shading than now; (b) the potential direct and indirect hydrological impacts, particularly the long-term impacts on riparian resources from structures placed within the floodplain; and (c) the

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2 A site visit on March 31, 2004, revealed that, though the box culverts are at least 6 feet high, at this time they have water in them except where sediment has collected. In some areas of sediment accretion, the sediment is so high that it would dissuade wildlife (even small to medium-sized mammals) from passing through. Wildlife probably use the railroad tracks and/or the narrow areas adjacent to and north and south of the tracks, but these do not constitute a viable wildlife linkage between the west and east side of Genesee Avenue.

impacts from maintenance (at any frequency) to maintain the hydraulic capacity of the modified 100-year floodplain.

13. The biological section of the DEIR should include a matrix that summarizes and compares the potential biological impacts from the implementation of each alternative, and other pertinent information.[3]

14. In addition to the information about the biological impacts of each alternative in the narrative, the biological section in the DEIR should include, at a minimum, the following graphics.

    a. A separate current aerial photo (scale should be such that it fills a 11 x 17 page) of each of the project areas for (i) alternatives 1 through 3, (ii) the second left turn lane on south bound Genesee Avenue, and (iii) the "improvements at Genesee Avenue/SR 52" if they are different from the second left turn lane. Each photo should have an outline of the project footprint (i.e., not a solid color representing the footprint and obstructing the view of the existing habitat/development within the footprint), including areas that would be only graded (i.e., no structures proposed).

    b. A separate current aerial photo (scale should be such that it fills a 11 x 17 page) that depicts the locations of the impacts identified in the matrix (requested in the previous comment) for each of alternatives 1 through 3, the second left turn lane on south bound Genesee Avenue, and the "improvements at Genesee Avenue/SR 52" if they are different from the second left turn lane.

Mitigation

15. The DEIR should thoroughly describe measures that would be taken to avoid or minimize the biological impacts identified in the preceding comments in this letter. These measures should be beyond and above the design elements and construction processes incorporated into the project alternatives to avoid or minimize impacts on biological resources. For example, the DEIR should describe measures that would be taken to avoid/minimize indirect hydrological impacts on the morphology, habitat, and natural functions of the riparian systems. The section in the DEIR on mitigation should address, at a minimum, the impacts identified in comments #10 and #13, and management of mitigation areas in perpetuity (e.g., endowment etc.).

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3 The matrix should include: acreage of losses of (a) each type of sensitive habitat, (b) sensitive habitat within the MHPA (please distinguish between the MHPA acreage that is already preserved and the acreage that is not, if any), (c) land serving as mitigation for previous project(s), and (d) habitat within restoration project(s); acreage of areas of sensitive habitat that would experience more or less shading than now; sensitive species that may be affected (please identify the species); fragmentation of habitat suitable for sensitive species; relative impacts on wildlife movement, wildlife linkages/corridors; discretionary actions needed [e.g., 404 permit from the U.S. Corps of Engineers, inclusive of section 7 consultation for take of vireo; duration of construction (i.e., # of years), seasonal timing of construction (e.g., during the avian breeding season?), daily timing of construction (e.g., after dark?); operational noise and lighting; direct and indirect hydrological impacts; and impacts from maintenance to maintain the hydraulic capacity.

16. While the City cannot predict the mitigation requirements that the permitting agencies (e.g., U.S. Army Corps of Engineers and Regional Water Quality Control Board) would impose for impacts to jurisdictional habitats, the DEIR should propose mitigation for those impacts that is consistent with the City's biology guidelines, and should thoroughly describe where and how the mitigation would occur, acknowledging that the permitting agencies' requirements may exceed these mitigation requirements. The DEIR should also address whether the proposed wetland mitigation may itself affect wetland habitat. If the proposed mitigation would cause significant biological impacts, the DEIR should analyze these impacts and propose mitigation for them [California Environmental Quality Act (CEQA) Guidelines, section 15126.4(a)(D)].

17. In addition to mitigation already addressed, the DEIR should require the following mitigation measures, at a minimum, for the alternative chosen for implementation, if any.

    a. Aspects of the project construction that might affect avian breeding behavior should avoid the avian breeding season. If avoiding construction during the breeding season is infeasible, pursuant to Sections 3503, 3503.5 and 3513 of the California Fish and Game Code, (a) all proposed vegetation clearing should occur outside of the avian breeding season (i.e., should occur between September 1 and February 14, January 14 for raptors) in areas that would support avian nests, and (b) where there is suitable nesting habitat for any nongame birds within 300 feet of the project work area (within 500 feet for raptors), measures should be implemented to avoid disturbing avian breeding behavior from indirect effects (e.g., noise, line-of-sight disturbances, night-lighting). The DEIR should describe the measures that would be taken.

    b. Only non-invasive, preferably native species, should be used for all proposed landscaping (e.g., in medians or shoulders) within, adjacent to, or upstream of either Rose or San Clemente canyons. For native species, local seed (or plantings from local seed) should be used to the extent possible.

Discretionary Actions

18. The City's incidental take[4] permit for the MSCP Subarea Plan does not authorize incidental take of federally listed species within U.S. Army Corps of Engineers' jurisdictional wetlands. Therefore, federal take authorization through section 7, provided there is a federal nexus, or section 10 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*) may be necessary for this project.

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4 "Take" is defined by the ESA as "harass, harm, pursue, hunt, shoot, wound, trap, capture, or collect or attempt to engage in any such conduct." [ESA §3(18)] "Harass" is further defined by the Service as "actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." "Harm" is defined by the Service to include "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering." [50 CFR §17.3]

19. The alternative the City Council chooses for implementation, if any, may require a Streambed Alteration Agreement (SAA) from the Department. The Department's issuance of a SAA for a project that is subject to the California Environmental Equality Act (CEQA) requires CEQA compliance actions by the Department as a Responsible Agency. As a Responsible Agency under CEQA, the Department may consider the City's CEQA documentation. To minimize additional requirements by the Department pursuant to Section 1600 *et seq*. and/or under CEQA, the documentation should fully identify the potential impacts to the jurisdictional habitats, and provide adequate avoidance, mitigation, monitoring and reporting commitments for issuance of the SAA.

The Wildlife Agencies appreciate the opportunity to comment on this NOP. The Department finds that the project would not be de minimis in its effects on fish and wildlife per section 711.4 of the California Fish and Game Code. We are available to work with the City and their consultants to obtain any necessary permits for the proposed project. Please contact Libby Lucas at (858) 467-4230 or Carolyn Lieberman of the Service at (760) 431-9440, if you have any questions or comments concerning this letter.

Sincerely,

Therese O'Rourke
Assistant Field Supervisor
U.S. Fish and Wildlife Service

FOR William E. Tippets
Deputy Regional Manager
California Dept. of Fish and Game

cc: Department of Fish and Game (Kelly Fisher)
State Clearinghouse

California Regional Water Quality Control Board

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February 28, 2005

Ms. Martha Blake
Associate Planner
City of San Diego Development Services Center
1222 First Avenue, MS 501
San Diego, CA 92101

Dear Ms. Blake:

SUBJECT: UNIVERSITY CITY NORTH/SOUTH TRANSPORTATION CORRIDOR STUDY EIR

The Regional Water Quality Control Board, San Diego Region (Regional Board) has reviewed the draft Environmental Impact Report (draft EIR) and errata for the University City North/South Transportation Corridor Study (Project); prepared by the City of San Diego (City). The draft EIR analyzes three basic transportation projects, and various combinations of transportation projects, within the University City area of the City of San Diego. Two main corridors have been identified: Regents Road Corridor and Genesse Avenue Corridor. Both of these corridors traverse Rose and San Clemente Canyons.

Overall, the draft EIR fails to provide sufficient information to support the conclusion that the project will not have a significant effect on water quality and beneficial uses. Furthermore, the draft EIR fails to identify project-specific measures that will mitigate significant impacts. The Regional Board requests that the Final EIR address the following specific concerns.

PROJECT DESCRIPTION

The project description in the draft EIR is vague, incomplete, and confusing; this makes it difficult to determine the full nature and extent of possible impacts to water quality and beneficial uses. The detailed engineering sections show typical sections, but do not provide information on the entire project. Furthermore, project features described in the text, are not shown on figures depicting project impacts (e.g., proposed parking lot to replace lost parking lot).

WATER QUALITY

Page 2-8 of the draft EIR incorrectly identifies designated surface water beneficial uses for Rose Canyon and San Clemente Canyon. Both canyons include Contact and Non-contact Recreation,

(REC-1 and REC-2), Warm Freshwater Habitat (WARM), Cold Freshwater Habitat (COLD), and Wildlife Habitat (WILD) beneficial uses. San Clemente Canyon also has the Rare, Threatened, or Endangered Species (RARE) beneficial use. The potential beneficial use of Industrial Service Supply (IND) has also been designated for both canyons. The EIR needs to accurately identify and discuss potential impacts to water quality and beneficial uses.

The draft EIR provides a brief explanation of the municipal storm water permit requirements, including site design, source control, and treatment control best management practices (BMPs). Page 4.3-53, *Drainage*, states that "Since the projects in question are roadways, engineering design must include methods to control runoff of rainfall containing petroleum products." However, the draft EIR provides no detail on how this will be accomplished. The document fails to identify specific construction and post-construction BMPs that will be implemented for each project alternative, the expected pollutants(s) and BMP effectiveness, and BMP maintenance requirements and responsibilities. Stating that BMPs are required does not support the conclusion that significant impacts to water quality will not occur.

The draft EIR states several times that dewatering may be required during construction; however, it fails to identify potential volumes, water quality, discharge rates and duration, discharge locations, and specific BMPs. In the absence of this information, the conclusion that impacts are not significant is premature.

Table 4.10-1 is misleading. The table uses inappropriate thresholds and makes the erroneous conclusion that significant impacts will not be significant because the City will comply with water quality standards and obtain permits; the draft EIR does not provide any information to demonstrate that the project can or will comply with water quality standards. The EIR needs to look at revising thresholds and adding additional thresholds. For example, the threshold that construction impacts on water quality would only be considered significant if over 1 acre of land was disturbed is inappropriate and does not relate to statements in the text. Furthermore, grading of less than 1 acre can result in significant impacts depending on the location, BMPs, and other factors (e.g., uncontained hydraulic line break on heavy equipment). Additional thresholds are provided in Section 4.10.2.1 that are not included in Table 4.10-1.

Proposed mitigation measures identified in Section 4.10.2.2 (vegetated detention basin) and Section 4.10.3.3 (detention facilities, planted areas, and energy dissipaters) are not identified in the project description. At a minimum, the location of the proposed facilities need to be delineated on figures; sizing criteria and maintenance requirements need to be described; and impacts resulting from their construction and operation need to be identified and assessed. It is critical that the EIR identify the locations and operations of the basins to allow the public and reviewing agencies to determine if the City is proposing to alter a riverine system to that of a ponded system. Detention facilities should be placed in upland areas, immediately adjacent to storm drain outlets. Regional Board staff would recommend denial of a Section 401 Water

Quality Certification application if detention facilities are proposed for construction within jurisdictional waters.

IMPACTS TO JURISDICTIONAL WATERS OF THE U.S. AND STATE

The Draft EIR does not clearly, consistently, and accurately identify existing conditions and impacts to waters of the U.S. and State. Specific examples include the following:

1. Figures 4.3-2 and 4.3-3A appear to identify different plant communities for the same polygon. Southern Cotton-Willow Riparian Forest (SCWRF) south of the train tracks on Figure 4.3-3A is labeled as Non-native Grassland (NNG) on Figure 4.3-2. Coastal Sage Scrub (CSS) and NNG on Figure 4.3-2 are labeled as SCWRF on Figure 4.3-3A.
2. For all figures that show temporary impacts, the lack of closed impact polygons makes it difficult to know whether an area will be temporarily impacted or not.
3. Figure 4.3-3A does not show temporary impacts to southern willow scrub north of the train tracks; this is shown as an existing community on Figure 4.3-2.
4. Existing unvegetated streambed is not shown on Figure 4.3-2.
5. Table 4.3-2 does not provide impacts to unvegetated streambed and SCWRF for Rose Canyon. Additionally, the table does not quantify impacts to Southern Willow Scrub (SWS) that is shown on Figure 4.3-3B in San Clemente Canyon and the figure does not show Mule Fat Scrub (MFS) that is in the table.
6. Figure 4.3-5A shows wet meadow when Figure 4.3-4 shows the same polygon as NNG. It is also not clear if the Native Grassland (NG) in Table 4.3-3 is the same as the wet meadow and/or NNG, and why NG would be CDFG and City jurisdiction in the table, but only City jurisdiction on Figure 4.3-5A.
7. Figure 4.3-4 does not show existing unvegetated streambed.
8. Fresh Water Marsh (FWM) on Figure 4.3-5B is not shown on Figure 4.3-4.
9. Table 4.3-2 breaks out impacts by canyon, but Table 4.3-3 does not do this. Breaking out the impacts by canyon between alternatives will facilitate a more accurate comparison of the alternatives.
10. Impacts from the Limited Roadway Changes (LRC) alternative should be shown on figures to allow the reader to clearly understand the areas of jurisdictional waters that will be impacted by this alternative.
11. Impacts from the LRC alternative in Table 4.3-7 are different than those in Table 4.3-5. It appears that the acreage of impacts to FWM have been transposed between temporary and permanent impacts. Other tables (e.g., Table 4.3-9) also have this discrepancy.

The draft EIR does not discuss direct and indirect impacts that may result from dewatering activities. For example, will dewatering activities dry-up the wet meadow in Rose Canyon? The document needs to clearly identify the level of dependence on surface and ground water, by plant community, and direct and indirect impacts from dewatering activities. The document should look at dry, wet, and average rain years to assess potential impacts.

The draft EIR also provides no discussion of how stream flows in Rose and Sycamore Canyons will be rerouted during construction activities; impacts within, upstream, and downstream of the project area; and proposed and alternative construction methods to reduce impacts from stream rerouting. Without this information, the full nature and extent of impacts resulting from project alternatives cannot be ascertained.

The EIR should also look at alternative access routes and construction activities to minimize overall impacts to jurisdictional waters. The document should also provide one summary table that allows the reader to easily compare impacts to jurisdictional waters from each of the alternatives.

The EIR needs an expanded discussion regarding the SWS that was restored as a result of a grant. The City of San Diego applied for, and received, a grant from the California Department of Parks and Recreation Habitat Conservation Fund Program for Riparian Enhancement/Restoration at Rose Canyon Open Space Park. The grant was to remove nonnative vegetation and replant the areas with appropriate native vegetation. It appears that portions of Rose Creek that was restored through this grant will be impacted by the Regents Road Bridge alternative, and possibly other alternatives. The EIR needs to clearly delineate the restoration areas on a figure and show and discuss direct and indirect impacts that would occur with each project alternative. Furthermore, the EIR needs to clearly discuss how the City of San Diego will rectify these impacts with the assurances required as part of the grant. The California State Parks procedural guidance requires assurances that the "Applicant will maintain and operate the property acquired, rehabilitated, or restored with the funds in perpetuity." Furthermore, the guidance requires assurances that the "Applicant will use the property only for the purposes of the California Wildlife Protection Act of 1990 and to make no other use, sale, or other disposition of the property except as authorized by specific act of the Legislature."

The City of San Diego also implemented mitigation within Rose Canyon for impacts associated with the 1996 trunk sewer project. The Regents Road Bridge alternative, and possibly others, could result in impacts to the mitigation area. The EIR needs to clearly delineate the mitigation area(s) on a figure and show and discuss direct and indirect impacts that would occur with each project alternative. Furthermore, the EIR needs to state if the mitigation area was to be preserved in perpetuity as part of the ACOE, CDFG, and/or Regional Board permits. If the mitigation area and/or grant restoration area are required to be preserved in perpetuity, it does not seem likely that alternatives that would impact the areas would be viable.

MITIGATION MEASURES

The draft EIR defers the identification of specific mitigation measures to the permitting process. This is in direct contravention of the CEQA guidelines (CEQA Guidelines § 15126.4 and 15126(e))and defeats the purposes of CEQA. Accordingly, each significant impact should have

clearly defined, detailed description of mitigation measures proposed to minimize significant effects to water quality and beneficial uses (CEQA § 21100(b)(3). CEQA Guidelines § 15126.4(a) state:

> *(1) An EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy.*
>
> *(A) The discussion of mitigation measures shall distinguish between the measures which are proposed by project proponents to be included in the project and other measures proposed by the lead, responsible or trustee agency or other persons which are not included but the lead agency determines could reasonably be expected to reduce adverse impacts if required as conditions of approving the project. This discussion shall identify mitigation measures for each significant environmental effect identified in the EIR.*
>
> *(B) Where several measures are available to mitigate an impact, each should be discussed and the basis for selecting a particular measure should be identified. Formulation of mitigation measures should not be deferred until some future time. However, measures may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way.*

Moreover, the lack of specific mitigation measures only serves to heighten the significance of the impacts because the City has not identified any measures that will mitigate significant impacts. The EIR needs to clearly identify mitigation site(s); mitigation site conditions and relationship to the impacted area(s); proposed mitigation activities (e.g., grading for creation, removal of exotic species for enhancement); success criteria; implementation schedule; remedial measures; and a qualitative and quantitative discussion of functions at the impact and mitigation areas. Identification of mitigation sites is particularly important for the City given their recent difficulties in identifying appropriate mitigation sites for impacts resulting from other City projects.

The wetland habitat mitigation table (Table 4.3-13) in the draft EIR is inadequate. The table needs to identify permanent and temporary impacts by plant community for each alternative; specific mitigation ratios; and whether mitigation is creation, restoration, or enhancement. The table also needs to separate-out impacts to the areas restored as mitigation for the trunk sewer project and grant project as, if impacts are legal, mitigation ratios will be significantly higher than those proposed for other areas. Out-of-kind mitigation is also likely to result in higher mitigation ratios.

The Regional Board recommends that the City correct all deficiencies in the draft EIR to provide the public and reviewing agencies with an accurate and complete description of the project, its

impacts, and specific mitigation measures. We also recommend that the City select an alternative that avoids impacts to waters of the U.S. and State, as the draft EIR has not demonstrated that impacts would not be significant; would be mitigated; and would be legal in areas restored as part of the grant and previous mitigation activities.

If you have any questions regarding this letter, please contact Ms. Stacey Baczkowski at 858-637-5594 or sbaczkowski@waterboards.ca.gov.

Respectfully,

John H. Robertus
Executive Officer

cc: California Department of Fish and Game; Ms. Elizabeth Lucas
U.S. Fish and Wildlife Service; Ms. Carolyn Lieberman

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July 14, 2006

Ms. Laurel L. Impett, AICP
Shute, Mihaly & Weinberger LLP
396 Hayes Street
San Francisco, CA 94102

Subject: **Final Environmental Impact Report, University City North/South Transportation Corridor Study.**

Dear Ms. Impett:

This comment letter on the subject Final Environmental Impact Report (FEIR) is submitted by the Conservation Biology Institute (CBI) on behalf of Friends of Rose Canyon. CBI is a non-profit conservation science organization whose mission is providing scientific expertise to support conservation and recovery of biological diversity in its natural state through applied research, education, planning, and community service. I have largely confined my review to the Biological Resources section in the FEIR; however I comment on other sections when relevant to the analysis of biological resources impacts. In general, I find the project's purpose and objectives are not clearly defined, the description of the project is not complete, the description of the environmental setting of the project is inadequate, the analysis of impacts is incomplete, and the proposed mitigation measures are inadequate to compensate for the impacts that this project would have on biological resources in the project area. In addition, a number of changes have been made to the FEIR and Biological Technical Report since the Draft EIR was circulated that are unexplained (for example, changes to impact acreages). These deficiencies leave the Biological Resources section of the document inadequate to allow the public and decision-makers to compare alternatives and select the least damaging alternative that accomplishes the project's purpose. I elaborate on these comments below.

Section 3.2 Project Purpose/Objectives does not clearly define purpose and objectives of the project.

This section of the FEIR defines the project purpose and objectives in very general terms, such as "relieve existing and future traffic congestion" or "Improve intersection level of service." These general objectives do not provide decision-makers with adequate thresholds with which to compare the performance of alternatives in meeting project objectives relative to the impacts associated with each. For example, as worded now any incremental improvement in traffic congestion or level of service will achieve the project's objectives; thus, given that all alternatives evaluated in detail in the FEIR perform at this level, the least damaging alternative must be selected. This is a particular problem when justifying impacts to wetlands and waters of the U.S., as will be discussed further below.

Section 3.3 Project Alternatives do not describe features of the project adequately.

The description of the project does not include all features of the project that may have environmental impacts. For example, the FEIR describes implementation of BMPs (i.e., sedimentation basins, grassy swales, and/or mechanical trapping devices) to control sedimentation and runoff (both quality and quantity). The characteristics, effectiveness, and locations of these facilities are not described. These project features could significantly change the character of biological resources in natural open space in the project area, and thus, should be described and analyzed in the FEIR. For example, if sedimentation basins are proposed, their sizes, locations, and maintenance schedules should be described for each project alternative. Likewise, if stormwater retention/detention facilities are proposed, their characteristics and locations should be presented in the project description of each project alternative.

Inadequate description of existing biological resources conditions.

The description of existing conditions (Section 4.3.1) has a number of deficiencies that prevent its use in a complete impact analysis. For example, surveys of existing conditions appear to be confined to an approximately 1,000-foot wide corridor around the centerline of the proposed alignment of the Regents Road bridge (i.e., 500 feet on either side of the centerline), while wetland delineations and least Bell's vireo and southwestern willow flycatcher surveys were conducted only within the proposed impact areas of the project. As acknowledged by the FEIR and Biological Technical Report, and discussed further below, indirect impacts of the proposed project can extend well beyond this arbitrary survey boundary (e.g., construction noise impacts can extend at least 500-feet and up to 1,000-feet from the edge of the Regents Road bridge). It is impossible to quantify potential impacts of the proposed project unless all biological resources that may potentially be affected are identified, described, and quantified. Biological resources surveys for the project should be expanded to include all areas that may be adversely affected by direct, indirect, and cumulative impacts of the proposed project.

The FEIR and Biological Technical Report describe the dominant riparian vegetation community in Rose Canyon and San Clemente Canyon as Southern Cottonwood-Willow Riparian Forest. However, the description provided in the FEIR, and additional information in the Biological Technical Report, indicates that this community would probably be better classified as Sycamore Alluvial Woodland. For example, the description of Southern Cottonwood-Willow Riparian Forest in the FEIR indicates that western sycamores are the dominant overstory species and that coast live oaks are present along the upper terraces of the creek channels. The description goes on to say that "western sycamore and coast live oaks are not typical components of Southern Cottonwood-Willow Riparian Forest." The "water resources" description in the Biological Technical Report, reports on historic riparian conditions of Rose Creek from historic (i.e., back to 1928) aerial photographs. The Biological Technical Report described the dominant conditions of Rose Creek prior to extensive development of the surrounding mesas in the area as "open floodplain riparian community supporting predominantly oak and sycamore trees along and active floodplain with scoured braided channels." This description is consistent with a sycamore alluvial woodland community. This issue is relevant because sycamore alluvial woodlands are much rarer (and poorly described) in San Diego County, are much less tolerant of increases in stream discharge as can occur with road projects. Furthermore, the changes observed in this habitat within Rose and Sycamore canyons, speaks to the level of cumulative impacts that have already occurred in these canyons, which is discussed further below. In addition, the description of this riparian habitat (regardless of its classification) has no information on the height of the canopy layer, which is relevant for assessing noise impacts as will be discussed further below.

In Section 4.3.1 (second paragraph), the statement "and an additional 15 to 25% of the site's flora is expected to be comprised of annual species that could not be detected during the early summer survey dates." was deleted from the document. However, the total number of plant species present (96) did not change, even though additional surveys dates outside of the summer period since the preparation of the DEIR are reported in the Biological Technical Report. The lack of additional annual plant species detected during the additional survey effort calls into question the comprehensiveness of the botanical surveys for the project. For example, a recommended mitigation measure for the project is to survey for willowy monardella prior to initiation of construction. Are surveys for this species not considered adequate? The question of the comprehensiveness of the surveys is particularly relevant given the inappropriately limited survey area (see comment above).

The last paragraph of page 4.3-9 includes the sentence, "None of the wetlands are within the jurisdiction of the City of San Diego." This is an incorrect statement. In addition, Tables 4.3-2 and 4.3-3 also provide an incorrect distinction between wetland jurisdictions, implying that federal, state and City of San Diego jurisdictions are independent of one another. In fact, wetland jurisdictions overlap. The Army Corps of Engineers jurisdictional wetlands also fall under the jurisdiction of the City of San Diego and the California Department of Fish and Game. The FEIR needs to clarify the

relationship of federal, state, and wetland jurisdictions, and ensure that statements regarding these jurisdictions are accurate.

Tables listing the acreages of various vegetation communities and wetlands jurisdictions in the FEIR have many unexplained changes since the DEIR. It is not clear whether these changes are corrections to errors in the DEIR or represent new information. The source of these changes needs to be clarified.

The FEIR impact analysis is confusing, not well supported, and under-represents impacts to biological resources.

1. FEIR Thresholds of Significance are Inadequate.

The thresholds of significance used in the FEIR are inadequate and inconsistent with those used in the Biological Technical Report, which are considered more appropriate. The project should be evaluated based on its potential to remove sensitive habitat, significantly degrade habitat quality, or adversely affect individual sensitive species and the existing native community as a whole (not just sensitive species). The context of the impact analysis is relevant to establishing the threshold for significance. For example, given the high degree of impact to biological resources in the study area from historic land use changes, additional incremental adverse changes should be considered significant. Thus, a relatively small acreage of impacts to less sensitive habitats within an area that has experienced a high level of biological resources impacts, such as Rose Canyon, should be considered significant, even though these impacts might not be considered significant in an area with very few historic impacts to biological resources.

The "population stability" threshold stated in the fifth paragraph on page 4.3-67 does not derive from the City of San Diego's Biology Guidelines or CEQA Significance Determination Thresholds, and is an inappropriate standard. Furthermore, even if the population stability threshold is used, there is no justification for the conclusions drawn. In fact, referring to the impacts to sensitive species from the Rose Canyon bridge alternative the FEIR states that "impacts to sensitive species are expected to consist of displacement from the site and potential loss of adults that are unable to establish an alternative territory or which displace others." Since there is very limited habitat available in the vicinity of Rose Canyon, displacement from the site may mean loss of the individuals from this area, thus loss of individuals from this local population.

2. Direct and Indirect Impacts are Understated.

The third full paragraph on page 4.3-47 states that direct impact to vegetation beneath the Rose Canyon bridge would not be significant because the bridge would stand approximately 60-feet above ground, which is anticipated to be high enough to allow for sunlight to reach the vegetation beneath the bridge. Nowhere in the FEIR is a detailed height profile of the bridge structure provided. The bridge is described as being a maximum of 60-feet high but is only 27-feet above the railroad tracks, and is ground level at the bridge abutments. This impact should be reanalyzed. It is logical to assume

that construction and operational noise impacts are related to the height of the bridge relative to the height of the vegetation adjacent to the bridge. Noise impacts to taller riparian woodland/forest vegetation would likely be significant for portions of the bridge span 60-feet above ground.

The FEIR greatly underestimates the magnitude of indirect impacts, particularly noise impacts in Rose Canyon. The existing noise levels in Rose Canyon are relatively high already, with peaks estimated at 55-56 dB at ground-level in the canyon. The FEIR states that the future operational noise contour of 65 dB(A) would extend as far as 140-feet from the bridge when the noise receiver is at-grade with the bridge (i.e, near the abutments) and as much as 240 feet when the receiver is line of sight from the bridge (i.e., towards the center of the bridge span). Since a 60 dB(A) significance threshold is used for biological resources, the 60 dB(A) contours should be clearly delimited to determine the anticipated area of impact. The FEIR states that there would be no significant impact from operational noise levels at the canyon floor based on empirical measurements taken at the Genesee Avenue bridge. However, mixing modeled noise projections with empirical measurements is inappropriate, particularly when the Genesee Avenue bridge has not been demonstrated to be an appropriate model for the Rose Canyon bridge. In addition, as discussed earlier, the riparian woodland canopy is a minimum of 25 feet above ground (as described for southern riparian scrub) and while the maximum height of the southern cottonwood-willow riparian forest is not presented in the FEIR, it is expected to be higher than that of the riparian scrub habitat. Thus, the canopy of these habitats, where avian species vocalize and nest (e.g., white-tailed kites, raptors), would potentially experience significant operational noise impacts. Detailed noise modeling should be performed to adequately assess the potential impacts of the Regents Road bridge alternative to biological receptors both laterally from the bridge and vertically from the top of the canopy to the canyon floor.

The FEIR identified indirect noise impacts from project construction as only a concern within 500-feet of the construction zone. This statement is not supported by any analysis or facts in the FEIR. Responses to comments on the DEIR that raised this issue state that "Mitigation monitoring at various construction projects required for such plans has generally found the noise impact contour to extend approximately 500 feet from the source." The specifics of and data for these studies should be provided to allow the reader to draw their own conclusions as to the validity of this "rule of thumb." The use of the word "generally" in the response to comment indicates that the 500-foot contour was not a universal finding of these mitigation monitoring studies, but no statistics are provided that allow further interpretation of this statement. In addition, the FEIR only identifies indirect noise impacts as an issue during the breeding season, when there would actually be an increase in noise to all year-round resident wildlife species of the canyon, as well as migratory breeders. Limiting project construction to outside of the avian breeding season is a mitigation measure to reduce significant construction noise impacts to breeding birds, but does not mitigate the significant indirect and cumulative degradation of wildlife habitat from operational noise.

As mentioned previously, western sycamores are sensitive to changes in hydrology. The project, particularly the alternatives that increase the amount of impervious surface cover in the vicinity of Rose and San Clemente canyons, have the potential to alter the hydrology of these creeks, and thus adversely affect sycamore dominated riparian habitat. The discussion of historic riparian conditions in the Biological Technical Report confirms the habitat changes that have occurred with urbanization of the surrounding area. A very small change in hydrology caused by installation of a storm drain from a new road or bridge can cause large local changes in stream hydrology. This issue was not adequately analyzed in the FEIR and was inappropriately dismissed as an insignificant impact. For example, when analyzing Land Use Adjacency Guidelines for the City's MSCP Subarea Plan for the Regents Road bridge (page 4.3-56), the subsection "Drainage" only addresses runoff of pollutants and not potential changes in stream hydrology or hydraulics associated with storm water runoff. The City's MSCP Subarea Plan Land Use Adjacency Guidelines state "All new and proposed parking lots and developed areas in and adjacent to the preserve must not drain directly into the MHPA." Neither the project description nor the impact analysis for the Regents Road Bridge alternative provides sufficient detail to assess how storm water runoff is being handled and what potential impacts might occur as a result.

3. Cumulative Impacts Analysis is Inadequate.

The analysis of cumulative biological impacts associated with the Regents Road bridge alternative is inadequate. The FEIR attempts to argue that the direct impact acreage to coastal sage scrub, wetlands, and non-native grasslands is low and project-level impacts would be mitigated by creating and acquiring habitats, thus cumulative impacts are not significant. However, the FEIR contains no analysis to support these conclusions. In addition, the FEIR argues that since a 60 dB(A) noise threshold is not exceeded on the canyon floor there is no significant cumulative impact. However, as is defined in Section 5.0 of the FEIR, cumulative impacts ~~is~~ are based on "as list of *past*, present, and probable future projects" (emphasis added). The Biological Technical Report describes the significant changes that have occurred to the Rose Canyon riparian system as a result of urbanization of the surrounding area. There has been substantial loss of biological resources in this area as a result of urbanization, such that Rose and San Clemente Canyons are virtually the *only* remaining natural resources remaining in the area. As discussed previously, the analysis of indirect noise effects did not consider noise impacts in the riparian canopy adjacent to the bridge, and the 60 dB(A) threshold figure was not derived as a "no effect" level to all wildlife species but rather as an arbitrary standard established for the least Bell's vireo with incomplete information. Loss of habitats would be partially mitigated by creation or preservation of habitats *outside* of Rose Canyon, resulting in a net loss of habitat *in this system*. The Rose Canyon system survives in the face of myriad threats and stresses from previous development in the area, and additional, incremental adverse impacts from habitat loss and operational noise can only be expected to push it to collapse. One can only question at what point cumulative impacts would be considered significant? The cumulative impacts must be reassessed using a more appropriate baseline condition, such as the extent and quality of biological resources that historically occurred in the area.

The discussion of compatibility with MSCP Subarea Plan policies is inadequate and misleading.

The FEIR goes to great lengths to dismiss the significant impacts to the Multiple Habitat Planning Area (MHPA) of the City of San Diego's Multiple Habitat Conservation Plan (MSCP) and argue that the proposed project is compatible with the MSCP. The proposed project, and the Rose Canyon bridge alternative in particular, is not a project covered by the MSCP, i.e., it was not specifically proposed by the City of San Diego or approved by the state and federal wildlife agencies to receive endangered species take authorizations issued under the MSCP. The FEIR attempts to use the Roads and Utilities – Construction and Maintenance Policies in the City's MSCP Subarea Plan to justify impact to the MHPA for each individual alternative. However, the analysis should look at the suite of available alternatives that are available to achieve the project's purpose, and determine which particular alternative would be most consistent with these policies and thus meet the City's obligations under the MSCP.

The intent of the MSCP and the Roads and Utilities – Construction and Maintenance Policies in the Subarea Plan are clear – impacts to the MHPA should be avoided unless no other feasible option exists. For example, Policy # 3 states, "Temporary construction areas and roads, staging areas, or permanent access road must not disturb existing habitat unless determined to be unavoidable." and Policy #4 states, " Construction and maintenance activities in wildlife corridors must avoid significant disruption of corridor usage." In the case of the Rose Canyon bridge, alternatives do exist that would reduce or eliminate both temporary and permanent impacts to the MHPA, and therefore those alternatives must be considered before the bridge alternative. This position has also been articulated by the state and federal wildlife agencies in their comment letters on the DEIR. As correctly described in the FEIR, Rose and San Clemente canyons are Core Areas of the MSCP. Core Areas are defined in the MSCP as: areas with a "high concentration of sensitive biological resources which, if lost, could not be replaced or mitigated elsewhere." The City of San Diego's CEQA Significance Determination Thresholds state that "any encroachment into the MHPA is considered a significant impact…" Thus, the FEIR must identify encroachment into the MHPA as a significant impact. In addition, Rose Canyon is mapped primarily as very high and high habitat value by the MSCP. Since the MHPA in Rose Canyon is within a MSCP Core Area and supports very high value habitats, the impacts to it, by definition, are significant and cannot be mitigated elsewhere.

The FEIR fails to provide the technical basis to conclude that mitigation would reduce impacts to a level less than significant.

The description of mitigation measures in the FEIR is inadequate to assess their potential for reducing impacts to a level less than significant. This is particularly true for mitigation of wetland impacts. The City of San Diego's Guidelines for Conducting Biology Surveys states "For instances where revegetation or restoration is proposed, a revegetation/restoration plan shall be prepared in accordance with Attachment III." No

such revegetation/restoration plan has been prepared. Wetland mitigation is described as taking place at an unspecified location within the "drainage sheds" of Rose Creek and San Clemente Creek. Since these areas already support functional wetland and upland habitats, it is unclear where wetland creation areas would be sited without displacing other habitat types. In addition, the mitigation ratios cited in the FEIR are likely low, especially given that some of the impacts are to existing mitigation areas, which will require higher ratios if allowed at all. Thus, it is very likely that even more area for mitigation will be required than is stated in the FEIR. Since the details of mitigation measures are deferred to a future time, there is no way to assess whether the impacts of the proposed project will, in fact, be mitigated to a level less-than-significant.

Section 404 of the Clean Water Act presumes that there are feasible alternatives available for non-water dependent projects that accomplish their project's purpose but do not require filling wetlands and waters of the U.S. It is the responsibility of the project applicant to refute this presumption. Furthermore, Section 404 mitigation sequencing guidelines, as well as the City of San Diego's biology guidelines, require project applicants to sequence impacts and mitigation, i.e., avoid impacts first, then minimize impacts, and then mitigate remaining impacts. The proposed project is not water-dependent and there are clearly project alternatives that are feasible, accomplish the project purpose, and would result in fewer impacts to wetlands and waters of the U.S. than the Rose Canyon bridge alternative. Thus, these alternatives must be selected.

National Wetlands Policies requires that there be "no net loss" of the Nation's wetlands functions and values. It will be extremely difficult to mitigate the loss of wetland functions and values supported by the Rose Creek system. As discussed previously, this drainage historically supported a sycamore alluvial woodland community with unique physical and biological properties. It will be exceedingly difficult to find a comparable area to serve as a mitigation site to recreate such as system to ensure no net loss policies are met. Many studies have shown that wetland mitigation sites rarely replace the full suite of functions and values at impact sites, and the probability of failure increases with the uniqueness of the system. Only by detailing the proposed wetland mitigation plan for the project, including the proposed site, planting palette, long-term maintenance program, etc. can a meaningful assessment be made of the probability of successful mitigation of significant impacts to wetland functions and values.

As discussed above, proposed mitigation for upland habitats includes "acquiring and preserving these habitats nearby" (Section 5.2.3.3). Thus, there would be a net loss of upland habitat acreage *within Rose Canyon* as a result of the project. Given the historic losses of habitat in the Rose Canyon area, this net loss of habitat should be considered a significant and unmitigable impact of the project.

<u>Analysis of impacts to the Rose Canyon Riparian Habitat Enhancement/Restoration Project is flawed.</u>

Comments on the DEIR identified that the Rose Canyon bridge alternative would adversely impact the Rose Canyon Riparian Habitat Enhancement/Restoration Project

area, which was funded by a grant to the City of San Diego from the California Department of Parks and Recreation. The grant was requested by the City to remove exotic plant species and plant native species within the Rose Canyon Open Space Park. A requirement of the grant, which was successfully implemented, was for the City to agree to restrict the use of the property developed with the grant funds to uses allowed by the California Wildlife Protection Act of 1990 unless permitted by a specific act of the State Legislature. Clearly, construction of the Regents Road bridge is not an allowable use by the California Wildlife Protection Act. The FEIR makes the absurd argument that the restoration project only consisted of isolated patches (shown in Attachment 3 of Appendix V.C) that can be avoided by the Regents Road alternative with the addition of a large retaining wall. At a minimum this argument violates the spirit of the grant agreement, and could be construed as deceitful. Deborah Knight with the Friends of Rose Canyon reports that within the *drainage* where exotic species were removed, native riparian trees have reestablished. Thus, the project can be deemed a successful enhancement of the Rose Canyon system, and the City should be applauded for its environmental stewardship efforts. However, for the FEIR to argue that building the Regents Road bridge is compatible with and would not be a significant impact to this project is a poor attempt to pave over the truth.

In conclusion, I find that the FEIR has many substantial deficiencies. These include definition of the project's purpose and objectives, an incomplete description of the project, an inadequate description of the environmental setting of the project, inadequate analysis of impacts, and ill-defined and inadequate mitigation measures that do not reduce impacts to less-than-significant levels. I strongly urge the City of San Diego not to certify the FEIR, that it be revised to address these deficiencies, and recirculated for further review.

Sincerely,

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Senior Ecologist

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April 13, 2005

Re: Comments on Biological Resources Report and Impact Analysis, and Draft Environmental Impact Report (DEIR) for the University City North/South Transportation Corridor Study

Dear Courtney

You have asked me to provide an analysis and commentary on the City of San Diego's Biological Resources Report and Impact Analysis ("Biology Report"), and Draft Environmental Impact Report (DEIR) for the University City North/South Transportation Corridor Study. As you know, I am a professional biological consultant residing in San Diego, and have over 24 years of independent experience in the preparation of biological studies, having prepared over 3,300 studies since 1981. A copy of my current resume and SOQ is attached. With respect to this assessment, I feel entirely capable to review the relevant documents, having spent many hours in Rose and San Clemente Canyons over the years. I am highly familiar with the flora, fauna, and habitat-types associated with these natural parks, as well as the California Environmental Quality Act, the City of San Diego's Multiple Species Conservation Program Subarea NCCP Plan, the City's Land-use Adjacency Guidelines, Environmentally Sensitive Lands Ordinance, and related environmental documents.

It is my professional opinion that Regents Road Bridge-associated impacts, including impacts associated with the I-52/Regents Road intersection, to sensitive habitat and sensitive plants must be considered significant and not mitigable to below a level of significance. This is because the bridge will permanently and substantially diminish habitat for wildlife and plants; substantially affect the habitat of a numerous sensitive, rare, or endangered species; permanently impact a regionally-significant wildlife corridor, directly and indirectly impact jurisdictional wetlands; and generate noise that will exceed the limits for bio-habitat protection (60 dBA Leq).

For ease of review, this letter is formatted to follow the general formatting provided in the Biology Report and DEIR. A summary of my most significant overall concerns about the adequacy of the analysis from a biological standpoint is provided first, as follows:

- The report does not identify a single "project" as defined by CEQA, and fails to provide an adequate biological alternatives analysis. This leaves no opportunity for cross-comparative analysis.
- The jurisdictional wetland delineation is clearly not correct. Significantly greater federal and state wetlands and waters are present in Rose Canyon, including a large ephemeral (vernal) pool wetland.
- The report does not contain any form of wildlife corridor study, in spite of the fact that Rose Canyon and San Clemente Canyon are recognized as regionally-significant corridors.
- The impact section minimizes temporary and temporal impacts.
- The shadow effects of the proposed bridge span are significantly underplayed. Direct, permanent, and non-mitigable impacts must be detailed, with the scientific framework/analysis and supporting documents to be provided.
- The mitigation section contains neither specific mitigation plans nor any details regarding the feasibility of proposed "generalized" mitigation approaches.

The following details reflect the various sections of the Biology Report and DEIR. The page numbers listed reflect the pagination of the Biology Report, although the same flaws have been incorporated into the DEIR, with some exceptions:

PROJECT DESCRIPTION SECTION (Pg 2)

The Biology Report does not provide a biological analysis of "Alternative 4". The report states that *"a biological analysis was not deemed necessary"*. Under normal circumstances, Alternative 4 would probably be discussed as one of the "environmentally superior" alternatives. The report must provide a full and comprehensive analysis of each of the seven alternative "projects." It is misleading to dismiss Alternative 4 by simply stating that it is *"not to be addressed further"*.

METHODS SECTION

General Survey Limitations (pg 8)
The report does not discuss the rationale for neglecting directed seasonal surveys for certain high-interest species (bats, etc.) predicted as occurring in the project site. A discussion of why certain studies were completed and others were not must be provided to the reader. How can the significance of impacts to these species be assessed in the absence of measurable survey data?

No rationale is provided in the General Survey Limitations Section of the Biology Report and DEIR for not completing a Wildlife Corridor study. The Management Summary/Abstract Section of the Biology Report briefly mentions that no "formal investigations" were provided, in spite of the fact that San Clemente and Rose Canyons are recognized as regionally-significant biological corridors. Completion of a formal Wildlife Corridor study is required to ascertain the significance of permanent, temporary, cumulative, and temporal project impacts.

The structure of the DEIR and Biology Report mislead the reader into believing that all the Alternatives (1-7) have similar levels of impact. This is a product of the "lumping" process that does not allow each alternative to be considered independently. For example, the I-52/Regents Road Bridge and I-52/Genessee Avenue Widening projects are "lumped" together with alternatives, providing little clear indication as to the nature of the alternative in its own right.

SURVEY RESULTS SECTION

Geology and Soils Section (pg 14)

The Biology Report and DEIR discuss the fact that Altamont Clay soils are present in the study area, but they do not discuss the relationship of this substrate with numerous rare geophytes, such as *Brodiaea*, *Muilla*, and other. This discussion must be provided, along with a rationale for not providing focused surveys for these rare species during periods of maximum detectability.

Water Resources Section (pg 14)

The documents state that side-canyon hydration within a potentially impacted tributary Rose Creek is wholly dependent on urban runoff. This is highly speculative and not substantiated by any facts. The report must provide a basis for this determination. To the contrary, most of the vegetation within this tributary wetland is likely natural in origin, as reflected by the natural physiography associated with the canyon. The "urban runoff" statement misleads the reader and downplays the significance of tributary waters of the U.S. such as this.

Botanical Resources - Flora Section (pg 14)

The documents state that *"The number of non-native species present (29) is considered relatively high"*. In my professional experience, this is incorrect, again misleading the reader into assuming that this is may constitute low value habitat. The number observed is relatively low in comparison with other urban canyon sites the City of San Diego, many of which contain nearly 100 percent non-native species.

The documents state that *"An additional 15 to 25 percent of the site's flora is expected to be comprised of annuals that could not be detected during the early summer survey season"*. Assuming that up to 25 percent of the site's flora was undetectable is unacceptable. This strongly suggests that surveys at other times of the year (such as during the spring) are needed complete the site flora and reduce this number to 5-10%, which are more typical of the industry standard. The report should have augmented the identified flora in the late summer or fall, if necessary to provide a complete and accurate botanical inventory. Which sensitive species might have been missed? *Holocarpha virgata* is probably present in the project alignment. What about the aforementioned geophytes, such as *Muilla clevelandii*? Impacts to sensitive species, in particular, such as these must be assessed pursuant to CEQA. Many of these species are not "covered" under the MSCP. This means that species-specific mitigation could be warranted, particularly in the case of rare geophytes. In the absence of survey data, the analysis is by definition incomplete and misleading.

Vegetation Communities Section (pg 15)

The documents list and describe fourteen discrete vegetation communities. Several of these are clearly misidentified, resulting in a general devaluing of these habitats.

The documents describe "Southern Cottonwood-Willow Riparian Forest". This vegetation community is not present in the project area. Southern Cottonwood-Willow Riparian Forest occurs *"along perennially wet stream reaches of the transverse and peninsular ranges from Santa Barbara south..."* (Holland, 1986). The actual vegetation community represented onsite is "Southern Sycamore-Alder Riparian Woodland" found in *"very rocky streambeds subject to seasonally high-intensity flooding. Platanus favors more intermittent hydrographs"* (Holland, 1986). The dominant tree species adjacent to the Rose Creek floodway is California Sycamore, or *Platanus racemosa*. By classifying this habitat as "cottonwood/willow" dominated, the documents do not acknowledge the significance of the massive Sycamores present along the rocky streambed. Sycamore-dominated woodlands are much rarer and of significantly greater endangerment than cottonwood/willow-dominated habitats in San Diego. This has bearings on the impact analysis. Impacting large California Sycamores, which are directly within the bridge alignment, with their associated understory would trigger substantially greater amounts of mitigation.

The documents describe Chamise Chaparral on the east side of existing Regents Road. Although Chamise is present, the vegetation community in this location is better classified as relict Southern Maritime Chaparral as indicated by the presence of Linda Vista formation and proximity to known large-block stands of this rare vegetation-type. The documents only report Chamise in this habitat - many others clearly present, with a brief inventory presenting no less than 11 chaparral indicators. Again, the documents downplay the diversity of this habitat-type. If correctly identified, mitigation requirements, sensitive species surveys, etc. would be more rigorous.

The documents discuss Native Grasslands. This vegetation community is not accurately mapped in the documents, however. Native Grassland is found as interstices in the sage scrub-covered slope areas between the end of Regents Road and the bottom of tributary canyon draining to Rose Creek. This area is mapped as coastal sage scrub only, in spite of the fact that numerous native grassland species are present on the slope. Native Grassland habitats are substantially more endangered than sage scrub, triggering more rigorous mitigation, directed spring surveys, etc.

A very large vernal wetland area is also mapped in the documents as Native Grassland. By labeling this jurisdictional wetland as "grassland", the report dismisses the regional significance of this large seasonal water body. Based on various factors, this feature may qualify as supporting San Diego Claypan Vernal Pool habitat within the floodplain fringe of Rose Creek. If correctly identified, mitigation requirements, sensitive species surveys, etc. would be more rigorous. Also, additional regulators (U.S. Army Corps of Engineers, others) would recommend a redesign that entirely conserves or minimizes impacts to this jurisdictional wetland.

ZOOLOGICAL RESOURCES - FAUNA SECTION (pg 21)

The report briefly mentions a variety of sensitive species that were either observed or expected to occur on the project site: Western Spadefoot, Orange-throated whiptail, Coastal Rosy Boa, San Diego Ringneck Snake, Two-striped Garter Snake, Coronado skink, Red-diamond Rattlesnake, Black-shouldered Kite, Red-shouldered Hawk, Cooper's Hawk, various owls, Downey Woodpecker, Blue-gray Gnatcatcher, and others. If these were observed or are expected, the documents must provide a detailed discussion of project-related impacts and mitigation opportunities for each.

The documents state that *"The Eucalyptus Woodland on-site is relatively small and patchy; thus, uses by avian species are expected to be limited to perching and occasional foraging..."* This is incorrect - nesting has been observed on or adjoining study area on numerous occasions by both the project biologists and naturalists associated with the Friends of Rose Canyon. The conclusions that the Eucalyptus Woodland is relatively small and patchy downplays the direct impacts associated with project implementation, specifically the direct "take" of raptors and other avian species. The report must acknowledge that the Eucalyptus Woodland supports nesting raptors, and must provide an impact analysis that assesses the local and regional significance of this loss, and provides compensatory mitigation.

I have observed *Neotoma* (woodrat) nests in several locations within the project alignments. The documents do not discuss this - no discussion of *Neotoma* is provided in the report. There is a high probability that the species present in the alignment is *Neotoma lepida intermedia*, or San Diego Desert Woodrat, a sensitive species. The documents must discuss the presence of this species, assess probable impacts, and provide a detailed discussion of mitigation.

WETLANDS SECTION (pg 23)

Mule Fat Scrub and "Wet Meadow" Section
The documents list Mule Fat Scrub and "Wet Meadow" as occurring onsite in the Wetlands Section of the report. These vegetation communities are not discussed in the Plant Communities Section of the documents, only in the Wetlands Section. The documents need a detailed discussion of habitat values and functions of each of these communities in the Plant Communities Section. The "Wet Meadow" was also not mapped on the Vegetation Exhibit (Figure 3a) in the Biology Report. This is confusing to the reader, and fails to provide disclosure with respect to project impacts.

Southern Willow Scrub Section
The documents state that *"two other isolated stands of SWS are located in the canyon, but not along or adjacent to a streambed."* This is not correct - these stands are located adjacent to Rose Creek and also within the unmapped "wet meadow" section which is clearly a federal jurisdictional vernal wetland.

Mule Fat Scrub Section
The documents separate this vegetation community from the adjoining areas of Southern Willow Scrub (SWS), creating a false dichotomy. This community is clearly a component of the SWS, based on its location and species composition. As part of the SWS, the habitat would qualify as federal jurisdictional wetland.

A large vernal wetland is present beneath the proposed alignment of the Regents Road Bridge. This feature, measuring approximately 390 feet in length by 120 feet in width (or slightly over one acre) is well established, supports an ordinary high water mark, supports a predominance of hydrophytic vegetation, and appears to support hydric soils. The pool also has adjacency to the floodway of Rose Creek, being situated at the periphery of the riparian floodway in the creek floodplain. The documents make only vague reference to this water body, referring to it as a "wet meadow". A previous report for this project, completed by Dudek and Associates in 1994, refers to this water body as supporting Freshwater Marsh vegetation. Freshwater Marsh is a regulated jurisdictional wetland, of high to very high biological resource value. The Biology Report and DEIR must recognize that a significant wetland

is present in this location, and provide an impact analysis with a discussion of associated regulatory agency permitting requirements.

WETLANDS FUNCTIONS AND VALUES SECTION (pg 32)

The documents understate the value of the onsite wetlands in supporting amphibians, such as Western Spadefoot (a sensitive species) and Pacific Treefrog. "Leaf litter" is stated as an important component of the amphibian habitat - this is generally incorrect and misleading. The specific hydrologic and heliotropic environment is critical to amphibian reproduction. Shading by the bridge would diminish this value significantly

The documents state that the on-site wetlands have "*moderately high*" physical and chemical functions. Nowhere in the documents are these alleged physical and chemical functions described. The conclusion that functions are "*moderately high*" understates the very high habitat value placed on these habitats during the regional preserve planning effort. The wetlands associated with this site have very high habitat value. This is misleading, again underplaying the regional and local significance of the wetlands along San Clemente Creek and Rose Creek.

The documents state that that "*upstream portions consist of narrower drainages that lack herbaceous vegetation*" This is untrue. Further, it states that "*these have lower physical and chemical functions*". This is untrue also. Most of the upstream portions of the on-site drainage features are well vegetated, and function in the important capacity to filter materials and support high-value wildlife habitat, including potential nesting thickets for Least Bell's Vireo and other very rare species.

SENSITIVE SPECIES SECTION (pg 33)

The maps provided with the documents do not show Spiny Rush, a sensitive plant, within the alignment of the Regents Road Bridge corridor, even though I observed several specimens of this large perennial species within the alignment in the spring of 2005. This misleads the reader into believing that the habitat is of less significance with respect to biological resources.

Sensitive Fauna Section
Report understates sensitive status of many of the raptors found within the project alignment - Red-shouldered Hawk, Barn Owl, and Great Horned Owl - are all protected raptors. This must be discussed in detail, as breeding populations would be affected by the project.

The documents state that Arroyo Toad, a federally-listed species, is not present because of lack of "*substantial, permanent ponding areas and sandy washes along stream courses necessary to support... Arroyo Toads*". This is incorrect. In fact, this open sandy habitat is well-represented in the alignment, and protocol presence/absence surveys must be conducted.

Vernal Pools Section (page 43)
The documents state that "*no vernal pools were found within the project area*". This is used as the rationale for determining that no San Diego Fairy Shrimp are expected to occur onsite. The documents also state that "*...a focused search for vernal pools was not performed over the entire study area*". This is inappropriate. A very large, vernal wetland is present directly beneath the alignment of the proposed Regents Road Bridge.

The onsite pool supports a predominance of hydrophytes during the inundation phase. Standing water was present in this basin for many weeks during the winter/spring of 2005. Waterfowl were observed on many occasions utilizing the pool. This large, seasonal pool could certainly support San Diego Fairy Shrimp, and protocol presence/absence surveys must be conducted, as the bridge supports will directly impact this jurisdictional wetland.

The rationale that "*no vernal pools...are expected to occur within any of the project alternatives*" is misleading. Extant, high-value San Diego Vernal Pool habitats are known to occur "*one mile to the east in the vicinity of Nobel*

Drive and MCAS Miramar." This is relatively close to the Regents Road bridge alternative vernal wetland area. It is anticipated that San Diego Fairy Shrimp could easily be transported between these pools and the large pool at the project site.

IMPACT ANALYSIS - DIRECT IMPACTS Section (pg 47)

The Biology Report provides an Alternative Comparison (pg 68) for the various "projects". The Regents Road Bridge-associated Alternatives (#1, #2, #3) are listed as the most impactive, with other Alternatives being less impactive. The Biology Report also states that *"of all the alternatives, the Regents Road Bridge would result in the highest impacts to biological resources, and ultimately result in the bulk of the mitigation requirements"*. This suggests that other alternatives, such as Genesee Avenue Widening (Alternative #4), Grade Separation (Alternative #6), or "No Project (Alternative #7) are clearly environmentally superior.

The documents state that the proposed Regents Road bridge span over Rose Creek will have no direct impacts. This is incorrect and not substantiated by the current scientific literature. Shadow effect will result in significant, direct, and unmitigable losses of under-span vegetation and wildlife values and functions, including corridor functions. The proposed 10 foot "sliver" separation between the two proposed bridge spans is not sufficient to prevent shading impacts.

Figure 6. Impact Area Map Section
This figure shows "islands" of habitat that will be "conserved" and not either permanently or temporarily impacted. These "islands" are biologically inviable, being subject to substantial edge effects from construction and the denuding of the adjoining habitat. For this reason, they must be assessed as impacted.

Bridge Abutment Impacts Section
The documents state that only Non-native Grassland and Coastal Sage Scrub impacts are considered "significant". Eucalyptus Woodland impacts are dismissed as "not significant". In this case, the loss of mature Eucalyptus Woodland must also be assessed as "significant" due to its function for raptor nesting. These direct and cumulative impacts are particularly important in this case, because such habitats are being rapidly depleted in this part of the City as even marginally developable lands are being urbanized.

The documents state that only the southern abutment will result in significant impacts. This is incorrect. The northern abutment also impacts sensitive habitat, including open foraging areas for local raptors. This, too, must also be considered a direct and cumulative impact.

Bridge Support Impacts Section
The documents state that only 128 square feet will be impacted by each of the bridge supports. This is incorrect, and contradicts other technical report data. Soil compaction and residual effects of construction render a much larger area permanently impacted, with a permanent habitat conversion to ruderal vegetation. The project impact analysis does not adequately address direct support impacts and long-term affects of support construction. The large vernal wetland is present in this location. These supports result in significant, direct, and unmitigable impacts to this feature.

Bridge Span Impacts Section
The documents state that the *"highest point of bridge...60 feet from the ground... some degree of habitat change...vegetation loss or habitat conversion... only expected on the north-facing slope immediately below the southerly bridge touchdown and immediately adjacent to the northerly bridge touchdown"*. It is unclear why the documents discuss the highest point of separation between the ground and the proposed bridge. Most of the bridge span is significantly closer to the ground. The shadow effects of the span are significantly underplayed, and the lowest point of bridge must be assessed, not highest point. Direct, permanent, and non-mitigable impacts should be detailed in this section. The scientific framework/analysis and supporting documents must be provided. This is a significant flaw of the biological analysis for these documents.

Bridge Construction Impacts Section
The documents state that the *"Construction contractor will be urged to limit impacts to the Diegan Coastal Sage Scrub and wetland area to absolute minimum"*. This is unenforceable, ineffective, misleading, and unjustified. Neither the construction contractor nor any of his/her associates will be under any obligation to "minimize" upland impacts within the construction zone. Nearly 100 percent of the habitat in this area will be destroyed, regardless.

In this section, the documents again state that only Non-native Grassland and Coastal Sage Scrub impacts are considered "significant". As stated above, Eucalyptus Woodland impacts are again dismissed as "not significant". In this case, the loss of mature Eucalyptus Woodland must also be assessed as "significant" due to its function for raptor nesting. This is particularly important in this case, because such habitats are being rapidly depleted in this part of the City as even marginally developable lands are being urbanized.

Although not discussed in the documents, construction of the proposed Regents Road bridge will result in certain habitat conversion, including the introduction of non-native species, changes in extant soil types, vegetative cover, site hydrology, and numerous other permanent changes. These must be considered significant and not mitigable. The restoration of viable habitat, particularly diverse upland habitats, is effectively infeasible and biologically indefensible. Numerous similar bridge projects in Orange County and San Diego County have attempted to restore high-value Coastal Sage Scrub and related habitat-types. In every instance, the diversity of the resultant habitat is very low, often the reflection of a near monoculture of the dominant and most aggressive species. The incremental but permanent impacts resulting from bridge construction will also be significant and non-mitigable.

ALTERNATIVE 3 SECTION

Rose Canyon Segment
In this section, the documents again state that only Non-native Grassland and Coastal Sage Scrub impacts are considered "significant". Eucalyptus Woodland impacts are again dismissed as "not significant". In this case, the loss of mature Eucalyptus Woodland must also be assessed as "significant" due to its function for raptor nesting.

San Clemente Canyon Impacts
In this section, the documents again state that only Coast Live Oak Woodland, Non-native Grassland, and Coastal Sage Scrub impacts are considered "significant". Eucalyptus Woodland impacts are again dismissed as "not significant". In this case, again, the loss of mature Eucalyptus Woodland must also be assessed as "significant" due to its function for raptor nesting

DIRECT IMPACTS TO JURISDICTIONAL WETLANDS AND OTHER WATERS SECTION

The documents state that the proposed bridge supports and the bridge span structures will have *"no direct impacts"*. This is not true. Two of the bridge supports, as designed, will be constructed in and at the edge of a large vernal wetland, and the span will directly impact canopy and understory vegetation as a result of shadow effects. Up to a dozen or more mature California Sycamores and large Arroyo Willows will be affected by the bridge as it is currently designed. This is significant and not mitigable.

The documents state that the jurisdictional habitats below the structure will not be impacted. All native habitats below urban bridges are significantly and unmitigably impacted by edge effects, including material thrown off bridge, debris from high-speed vehicles, etc. These areas degrade over time to inviability. Excellent examples of this may be seen in Los Angeles County, where bridges have been in place for many decades. In every case, the habitat beneath the bridge is extremely degraded. Other new bridge structures (SR 241 near the Upper Oso Reservoir in Orange County, and others) also show incipient signs of habitat degradation as a result of edge effects.

Bridge Construction Impacts Section
The documents state that the *"Construction contractor will be urged to limit impacts to the jurisdictional habitats to the absolute minimum..."*. This is, again, unenforceable, ineffective, misleading, and unjustified. Neither the

construction contractor nor any of his/her associates will be under any obligation to "minimize" wetland impacts or impacts to jurisdictional habitats within the construction zone.

The documents state that *"everything within the demarcated zone would be impacted, albeit temporarily"*. This is not correct. Everything within the demarcated zone will clearly be impacted in a permanent and irreversible manner. All other urban bridges in Southern California show permanent effects of bridge presence. Effects include trampling, transient occupancy beneath the abutments, trash accumulation (broken glass, tire parts, etc), debris, and related edge effects. Over time, these degrade the habitat to the point of effective inviability. The report must acknowledge this and discuss each of the effects in detail.

SENSITIVE SPECIES DIRECT IMPACTS (pg 60)

The documents state that impacts to Clay-field Goldenbush are not significant. This is a questionable and misleading assessment. Clay-field Goldenbush is a very rare species, apparently undocumented in Rose Canyon previous to this study. The population parameters in the vicinity of the project are entirely unknown. However, impacts to this rare species are clearly significant, as defined by CEQA. The documents must reflect this assessment, based on existing biological information, and provide a detailed discussion of species-specific mitigation. Clay-field Goldenbush is not "covered" under the City's permit pursuant to the MSCP.

The documents state that impacted birds would be "*displaced*" from the site. This is misleading. All specimens impacted must be considered "lost". Although the general reading public may believe that birds can simply "fly away" or be "displaced" and settle in new habitats, this neglects that fact that most acceptable habitats are already occupied by resident birds. Unfortunately, in nearly every case, these "displaced" birds end up being "lost" or destroyed by predators, disease, or inhospitable conditions.

WILDLIFE CORRIDOR DIRECT IMPACTS SECTION (pg 62)

As discussed previously, a regionally and locally significant wildlife corridor exists along Rose Creek, linking natural areas to the east on MCAS Miramar with lands to the west, eventually joining San Clemente Canyon to the south. The documents state that *"The physical presence of the Regents Road bridge would likely have some impact on wildlife movement through Rose Canyon."* This is not quantified. The documents further state *"However, wildlife movement within the canyon is anticipated to be already somewhat constrained."* This is vague and unsubstantiated by study. Stating that the Regents Road bridge would be less impactive than the existing Genesee Bridge is irrelevant and again misleading. The report needs to draw quantifiable conclusions regarding direct impacts to the existing wildlife corridor. As stated previously, the edge effects from bridge presence will degrade the roadway corridor, thus permanently, significantly, and unmitigably impacting the wildlife corridor. Most significantly impacted will be keystone species such as Bobcat, Mule Deer, and others. The bridge will increase habitat fragmentation in Rose Canyon by creating a permanently degraded zone beneath the span. This habitat fragmentation in combination with the direct effects of widening the existing Genesee bridge would clearly result in significant, non-mitigable project impacts.

The documents state that the "*study of this phenomenon* (corridor impacts from existing Genesee Bridge) *was not part of the scope of the current study*". It is unclear why this was not studied. Wildlife corridor functionality is critical to the success of the Subregional NCCP, and extremely relevant and critical in drawing conclusions regarding wildlife corridor functions and values, particularly in constrained linkages such as is present beneath the Genesee Bridge.

INDIRECT IMPACTS SECTION

This section is very brief and understates the permanent, indirect impacts caused by the presence of a new bridge across Rose Canyon. These include permanent, adverse, and significant effects caused by increases in:

1. Noise --
   The current wildlife corridor will be subject to significant new (undefined) noise levels as a result of vehicular traffic and other affects. This is likely a significant and unmitigable, permanent indirect impact of the project as proposed.

2. Runoff from Hardscape Surfaces --
   The presence of four acres of new, impenetrable hardscape (pg 4.10-12 of DEIR) will significantly modify the drainage patterns associated with riparian area. This is a significant and unmitigable, permanent indirect impact of the project as proposed.

3. Erosion --
   Erosion adjoining the supports and abutments, and (ultimately) within Rose Creek will significantly modify the drainage patterns associated with riparian area and nearby upland areas. This is likely a significant and unmitigable, permanent indirect impact of the project as proposed.

4. Siltation --
   It is anticipated that siltation from the eroded soils could significantly modify the drainage patterns associated with Rose Creek and its tributaries. Although sedimentation basins and grassy swales are proposed in the DEIR, these have not been assessed with respect to direct biological impacts. This is likely a significant and unmitigable, permanent indirect impact of the project as proposed.

5. Debris Accumulation --
   All bridges over urban canyons accumulate a significant amount of debris beneath the span. No discussion of this issue is provided in the documents. What assurances are there that this debris will be removed on a regular basis? What would the biological impacts of debris removal entail? This needs full discussion in the documents. This is clearly a significant and unmitigable, permanent indirect impact of the project as proposed.

6. Dust --
   Nuisance dust from vehicular traffic on the bridge will contribute to the degradation of the habitat beneath the span. This is not the same as construction dust. The generation of nuisance dust over the life of the bridge span must be thoroughly assessed. This is clearly a significant and unmitigable, permanent indirect impact of the project as proposed.

7. Light --
   Although the documents briefly discuss light control, the indirect impacts of vehicular lighting and overhead lighting must be discussed in detail. This is a significant and unmitigable, permanent indirect impact of the project as proposed.

8. Fires (from debris off the bridge surface) --
   The presence of a substantial vehicular bridge over Rose Canyon will significantly increase the probability for a wildfire as a result of debris thrown off the span. This is clearly a significant and unmitigable, permanent indirect impact of the project as proposed.

9. Transient Occupancy (beneath abutments) --
   The bridge abutments would likely attract transients, graffiti, trampling, etc. These factors will incrementally affect the long-term viability of the wildlife corridor, the habitat beneath the span, and the habitat adjoining the abutments. This is clearly a significant and unmitigable, permanent indirect impact of the project as proposed.

10. Invasives --
    Urbanization facilitates the spread of noxious invasive species. Also, the documents defer review of the landscape plan and invasives control plan and disclosure of impacts that should be reflected in the DEIR to

the Deputy Director of LDR. This is clearly inappropriate. These measures must be discussed now, with an opportunity for citizen input.

MITIGATION SECTION

The documents (pg 69) defer mitigation because "*no specific, approved project*" is being proposed. It states that "*no specific mitigation sites are proposed nor have conceptual mitigation plans been developed.*" The rationale for this is that "*plans should be developed when a specific alternative is chosen.*" This strategy fails to provide full and timely disclosure - mitigation must be provided that is project-specific and impact-specific in the DEIR.

The documents state that "*whichever alternative is chosen, indirect construction impacts including noise, dust...*" This suggests that construction is inevitable, and that the "no project" alternative project is not available. It is entirely inappropriate to draw this conclusion in the Biology Report and Biology subsection of the DEIR, particularly in the instance of not having a single defined project.

MITIGATION FOR WETLAND IMPACTS - GENERAL

This section suggests that wetland creation within Rose Canyon (for the Regents Road Bridge alternative) would fully mitigate impacts associated with the project. No specific locations, other than "*disturbed areas in the canyon* (which) *could be used*" are discussed. Any proposed wetland creation would likely result in habitat conversion, resulting in additional secondary habitat impacts. Details of where and how mitigation would be provided, even at the conceptual level, are clearly required now for full disclosure.

This section must list each of the alternatives, with specific mitigation for each measurable impact. For example, specific mitigation for the permanent wetland impacts associated with the bridge span across Rose Canyon must be detailed.

MITIGATION FOR UPLAND IMPACTS

This section provides vague and non-specific "generalized" mitigation recommendations for upland habitat impacts. For example, the report states that "*Impacts to Non-native Grassland should be mitigation by planting this vegetation type within Rose Canyon to replace exotic plantings*" This is incomplete and potentially very misleading. Which areas of exotic plants? How will this planting be done? The report needs to detail the mitigation approach beyond general, vague statements such as this.

The Bridge Span section discusses lighting - how will lighting impacts to the vegetation below the bridge (and accompanying fauna) be avoided? Again, the report fails to detail how mitigation for lighting impacts will be provided, beyond vague statements such as "*lighting... must not extend into the canyon*". This is an unachievable goal, and the documents must conclude that lighting impacts are significant and not mitigable.

Noise impacts are not assessed in the documents, other than concluding that if noise levels were below 60 dBA Leq, impacts would be considered less than significant. How does the project provide specific mitigation measures to ensure that permanent noise impacts will be less than significant (i.e: less than 60 dBA Leq)? Raptors (including sensitive species) often nest at significant heights - how will these nests be shielded from excessive traffic noise? The DEIR states that 600 linear feet of cut/fill will be "at grade" and significantly lower segments of the proposed bridge are proposed. The report must detail project design features that will clearly and definitively support the conclusion about noise impacts and mitigation.

The Bridge Construction Section mentions (in discussion of the Migratory Bird Act) that "*If nesting birds are detected during this survey in areas to be impacted, the nest locations shall be protected and left undisturbed until fledging of offspring occurs.*". This is vague - how will the nests be protected? Who will verify that fledging has taken place without "take"? This is typical of the vagueness of the mitigation section of this report. Specific details

of compliance with the Migratory Bird Treaty Act and California Fish and Game Code, which prohibit the "take" of most birds, must be developed and provide at this time.

DEIR

At the end of the Biological Resources Subsection (Section 4.3), the DEIR contains a summary table, Table 4.3-16, (on page 4.3-76). This table apparently summarizes biological resource impact significance, as determined by the project consultant, ProjectDesign Consultants of San Diego.

The Biological Resources Report (page 77) concludes that wildlife corridor impacts are *"problematic*, and that *"This impact is considered non-mitigable"*. This is in direct conflict with the data presented in the DEIR in Table 4.3-16 and the conclusions of ProjectDesign Consultants.

It is my professional opinion that bridge-associated impacts to sensitive habitat and sensitive plants must be considered "SNM", or significant and not mitigable to below a level of significance. This is because the bridge will permanently and substantially diminish habitat for wildlife and plants; substantially affect the habitat of a numerous sensitive, rare, or endangered species; directly and indirectly impact wetlands; and generate noise that will exceed the limits for bio-habitat protection (60 dBA Leq).

Thank you for the opportunity to provide comments on this DEIR and Biology Report. Please contact me if you have any questions.

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April 15, 2005

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Re: Draft Environmental Impact Report for the University City North/South Transportation Corridor Study

Dear Ms. Coyle,

This comment letter is submitted on behalf of your client, Friends of Rose Canyon. It presents the results of our review of both the noise impact study (Appendix E) and Draft EIR noise section for the University City North/South Transportation Corridor Study (UCTCS). I have more than 30 years of experience in the assessment and control of environmental noise. I studied acoustics and received an MS in Mechanical Engineering from UC Berkeley and I am a registered Professional Engineer in California. Our firm is currently providing on-call acoustical consulting services to Caltrans statewide.

In summary, my opinion is:

(1) The noise study does not correctly assess the significance of noise impacts upon the residential neighbors located adjacent to Regents Road north and south of Rose Canyon.

(2) The noise study does not correctly assess the impact upon people and biological resources within Rose Canyon Open Space Park.

(3) Mitigation measures which are recommended are not sufficient to reduce impacts to a less-than-significant level. It is likely that the noise impacts upon sensitive receivers resulting from the Regents Road Bridge would be significant and unavoidable.

My comments address the following:

1. The Noise Study's inadequate and incorrect assessment of existing noise levels.
2. The Noise Study's incorrect analysis of noise impact standards of significance.
3. The inadequacy of the Noise Study's analysis of construction noise impacts.

4. The inadequacy of the Noise Study's analysis of traffic noise issues and mitigation measures.
5. The inadequacy of the Draft EIR noise section.

My conclusion:

The Draft EIR noise section fails to correctly characterize existing ambient noise levels, predict future noise levels at sensitive receptors (including residences and within Rose Canyon Open Space Park), evaluate the impacts with respect to CEQA guidelines, and evaluate the effectiveness of mitigation measures for both operational and construction noise. The noise study therefore fails to provide a basis for a decision maker to make a decision regarding the significance of impacts and whether or not the impacts could be mitigated to a less-than-significant level.

I. Noise Standards Omission (Noise Study, page 2)

The noise standard applicable to biological resources (e.g., California gnatcatcher and other sensitive birds) should be included here.

II. Existing Noise Levels (Noise Study, page 2)

- **The Noise Study inadequately describes the existing noise environment and reports numbers that are higher than actually occur. The Noise Study thus develops a baseline that incorrectly lessens the potential impacts of the increase in noise attributable to the Regents Road bridge.**

The description of the existing noise environment is not sufficient to provide a basis against which project impacts can be assessed.

The Regents Road Bridge would connect together the ends of two dead end road segments, completely changing the traffic patterns and the resulting noise environment at residences adjoining each end of the project, as well as within the canyon itself. In order to understand the change in the noise environment, one must fully characterize existing ambient levels. The 54-hour noise survey mentioned on page 2 of the Noise Impact Analysis could be an adequate basis for such a determination, but is not adequately described. It is likely that the hour-by-hour distribution of noise levels will change in the future.

It is, therefore, necessary to look at the hourly distribution of noise levels and the distribution of noise levels within each hour as they currently exist in order to adequately assess the potential change in the noise environment that would result from the proposed project. At a minimum, the data necessary would include the hourly L_{eq} and the statistical descriptors of noise levels within each hour represented by the L_{01}, L_{10}, L_{50}, and L_{90} noise descriptors. Measurement locations are not documented. It is impossible to tell from the information in the report where the measurements were made, with the exception of the canyon floor measurement. For instance, where or what is the "large berm," in the second column of data in Table 1?

- **The measurement survey appears to have been completed without much time spent in the field by an observer who could describe what the relative contributions of the various sources are to the existing ambient.**

I conducted an attended noise survey on Tuesday, April 5, 2005. Existing ambient measurements were made at two locations in the residential neighborhood along Regents Road south of Rose Canyon, at one location in the residential area north of Rose Canyon at the southern terminus of Regents Road, and at one location in Rose Canyon. The data are shown in Table 1. Our data were gathered using a Larson Davis Laboratories Model 820 Precision Type 1 integrating sound level meter calibrated before and after the survey. Our measurements conducted south of the canyon and within the canyon are generally consistent with the limited data described in the Noise Impact Analysis, but the environment is much more interesting and complex than what can be simply characterized by the hourly average L_{eq} or 24-hour CNEL noise metrics. Our data gathered at the north rim of the canyon (at the southern terminus of Regents Road) is, as one would expect, not dissimilar from data gathered in the canyon and at the south rim.

On a short-term basis, the noise environment is affected by jet aircraft operations at the Marine Corps Air Station. The energy average noise level (L_{eq}) increases about 10 decibels for a 10-minute interval that includes a jet aircraft operation as compared to one that does not. It has to be understood that the jet aircraft noise is a very short term, high noise event that only affects the noise environment during the brief interval of the operation (e.g., at takeoff). These takeoffs were observed to occur approximately once every 30 to 60 minutes and affected the noise environment in the study area for a period of about 30 seconds. That is what is interesting about the statistical descriptors. One can see by reviewing the data in Table 1 that the median sound level (that is, the sound level exceeded 50 percent of the time) was unaffected by the jet aircraft operations. This provides a good measure of what the noise environment is actually like in the area most of the time.

- **There is a problem with the noise measurements reported in the noise impact analysis at the north side of the canyon.**

It can be seen that noise levels are typically 45 dBA +/- 3 dBA, depending upon the location or time of the measurement whether or not jet aircraft operations occur briefly during the measurement interval. Our data showed noise levels were slightly higher at Measurement Location 4 along Regents Road near Porte de Merano because of its proximity to the busier section of Regents Road to the north. Based on our attended measurements, there is no evidence to support the high noise levels that the DEIR Noise Study reported for the north side terminus. It would appear that the measurement site was either poorly selected in a non-representative location near a localized noise source, or there was some type of atypical noise occurring during the measurement which was unreported. An atmospheric effect, such as described at the bottom of page 2, would have affected all of the measurement locations in the area, not simply the north rim position.

III. Noise Impacts Standards of Significance (Noise Study, page 7)

- **The Noise Study fails to correctly interpret the CEQA checklist questions. Its interpretation is inconsistent with the fundamental precepts of CEQA and the historical evaluation of noise impacts based on "the increase in the ambient."**

The second paragraph states, "Noise impacts would be considered significant if they cause standards to be exceeded where they are currently met, or if they create a measurable increase in noise levels in an already noisy environment."

The CEQA checklist questions ask the following:
Would the project result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
(b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?
(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?
(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?
(e) For a project located within an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?
(f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Because the project is a roadway, checklist items (e) and (f) are not applicable.

The first checklist question in no way implies that a project can only be considered to cause a significant impact if it generates noise in excess of standards in a setting where they are currently met. It simply asks, "Would the project expose people to noise levels in excess of standards?" In a similar fashion, checklist questions (c) and (d) simply ask, "Would there be a substantial increase in ambient noise levels, either temporarily or permanently, in the project vicinity above levels existing without the project?" The checklist questions say nothing about applying the substantial increase test "in an already noisy environment".

- **The question CEQA asks is, "Would there be a substantial increase in ambient noise levels above levels existing without the project?"**

The only question left to the interpretation of the analyst or local jurisdiction is what constitutes a substantial increase. There can be a substantial increase in noise leading to a finding that a noise impact is significant even if the resultant noise level with the project is below the noise level considered "normally acceptable" for a given land use by a local jurisdiction. This interpretation is necessary to protect the environment. Any other interpretation, such as the DEIR's use of a

particular threshold to trigger the assessment, is inconsistent with the fundamental precepts of CEQA and the historical evaluation of noise impacts based on "the increase in the ambient."

IV. Construction Noise (Noise Study page 8)

- **Statements are inconsistent with construction noise levels identified in the report and data from literature.**

The third paragraph of the construction noise section states, "Because of the mobility and variable duty cycle of mobile sources, such as dozers, backhoes, graders, etc., the 75 dBA L_{eq} standard is typically maintained within the construction right-of-way. Any possible violation of the 75 dBA standard would occur in close proximity to semi-stationary sources, such as pile drivers. Pile driver operation would occur mainly in the canyon floor away from occupied residences."

These statements are inconsistent with construction noise levels identified in the report and data from literature. Residences adjacent to Regents Road would be located immediately adjacent to heavy construction activities that include the paving of new roadway lanes, the construction of retaining walls, etc. Such heavy construction activities typically cause hourly average noise levels of up to 88 dBA L_{eq} at a distance of 50 feet. Construction activities causing an hourly average noise level of 88 dBA L_{eq} at a sensitive receptor, occurring only one hour per day, would generate noise levels above the 75 dBA L_{eq} 12-hour average.

CEQA checklist question (d), relating to a substantial temporary or periodic increase in ambient noise levels, should specifically be evaluated with respect to construction noise. This evaluation is complex, requiring a thorough description of and understanding of the duration of the exposure at a particular receptor and the amplitude of the noise exposure at a particular receptor. Without a thorough evaluation of the construction noise environment, it is impossible to make a finding regarding a substantial temporary or periodic increase in ambient noise levels. No assessment has been presented with respect to this checklist item. The analysis is, therefore, inadequate.

- **There is no basis given for the conclusion that the impact zone is limited to 500 feet from the source.**

In the fourth paragraph (p. 8) the following statement is made, "Although a 60 dBA L_{eq} equipment noise level could theoretically extend for 1,000+ feet from the activity, the typical zone of avian habitat noise impact is around 500 feet from the source. As such, canyon floor construction activities within 500 feet of riparian habitat considered as suitable for occupation for threatened or endangered species during their breeding season (early March to mid August) would be considered a potentially significant impact."

There is no basis given for the conclusion that the impact zone is limited to 500 feet from the source. During the construction of the bridge, construction noise will be generated near the ground but also high above the ground. Such activities will propagate long distances unattenuated by ground absorption. This is not a "typical" situation. The analysis of potential construction noise impacts on the riparian habitat requires a detailed evaluation of the

construction noise that would be expected during each phase, the location including height above the ground of the noise sources and projected noise levels into the habitat area, and an assessment by a qualified biologist of the associated potential impacts.

V. Regents Road Bridge (Noise Study page 11)

- **The analyses of the noise impacts for the Regents Road Bridge Alternative are misleading, utilize inappropriate methodologies, and lead to the wrong conclusions regarding impacts and the effectiveness of mitigation measures.**

- **The presentation of the analysis, the description of the impact, and the subsequent discussion of mitigation measures is completely insufficient to inform a person as to the significance of the noise impact.**

- **The character of the noise environment at residences located north of Governor and south of Arriba, will be permanently an unalterably changed for the worse.**

(This applies to the Regents Road bridge in any of the three alternatives which include it.)

To assess the significance of noise impacts from the Regents Road Bridge Project, one must compare future noise levels with the project to levels existing without the project. The best estimate of noise levels existing without the project, near the north and south terminus and within the canyon, are existing ambient noise levels. Typically, the existing conditions must be used as the baseline throughout a project area. In this instance, there is no basis for an expectation that ambient noise levels unaffected by local traffic will change at all, regardless of one's interpretation of what the baseline condition should be.

In Table 2 in the Noise Study, the Regents Road segment identified as "North of Governor" in the existing conditions column shows a level of 59.8. The table does not identify the noise metric (as it should), but the previous page states that this is a CNEL (dBA) at 50 feet from the roadway centerline. It is not correct to characterize the noise environment for all of the sensitive receptors potentially affected by this project which are located north of Governor by some arbitrary traffic volume that, if applicable at all, is only applicable just north of the intersection of Regents Road and Governor. Local traffic is not a significant source of noise in these areas. The existing ambient noise measurement data should have been used.

The measured noise level was shown in Table 1 to be 53 to 54 CNEL. On the "large berm," the existing noise level was 56 CNEL. On the canyon floor, the existing CNEL was shown to be 57 to 58 dBA. Data from the north side terminus, as previously discussed, is considered to be incorrect and to overstate the existing ambient noise level. The Table 2 projections do not even include the residential receptors located between the north rim of the canyon and Porte de Merano. People live on both sides of this closed section of roadway about 900 feet long north of the canyon. This is an omission.

- **The noise level increases show a comparison of the future no project condition to the future with the project or the future cumulatively. The correct analysis would compare each of these future scenarios to the existing noise level.**

On a 24-hour average basis, including the effects of aircraft noise, railroad trains, and everything else in the ambient, the increase would be approximately 18 dBA. This is a severe noise impact. Furthermore, if one were to compare the existing traffic noise levels in the area, which consist primarily of the steady noise of distant traffic from I-5, to the future noise environment that would be dominated by high speed vehicular traffic immediately adjacent to residences in the canyon area, the increase would be approximately another 10 dBA as reflected in our ambient noise measurement data presented in this report. Midday traffic noise levels are approximately 45 dBA, plus or minus 3 dBA. Projected traffic noise levels, assuming a speed of 45 mph, are about 72 dBA at a distance of 50 feet from the centerline of the roadway. Such increases are severe.

Furthermore, if the expected speed of the traffic on the roadway is increased to 55 mph, anticipated noise levels would increase another 2 dBA to approximately 74 dBA at 50 feet from the roadway centerline during the peak traffic periods and on a 24-hour average basis. The increase in the median noise levels during the typical daytime periods (approximately 45 dBA) would increase to more than 70 dBA throughout the day. This 25 dBA increase in ambient noise levels would be so severe, it cannot be adequately characterized with words.

V. Traffic Noise

- **A general discussion of traffic noise levels is inadequate** (p. 14).

Noise levels should be projected to specific representative receptor locations north of the canyon, in the canyon, and south of the canyon so that findings can be made with respect to the change in noise levels. The number of sensitive receptors affected and to what degree they would be affected should be identified.

- **It would appear that noise barriers will not be reasonable or feasible and that noise levels will not be mitigatable.**

The table at the top of page 15 does not correctly identify the needed noise reduction in order to mitigate the impact. Reducing noise levels to 65 dBA L_{eq} does not mitigate the significant noise impact to a less-than-significant level. Noise level increases will remain severe, even after implementation of the recommended measures. Furthermore, there would be no attenuation at upper-story areas that would also experience a substantial increase. A detailed analysis of the noise barrier effectiveness must be conducted to determine whether it is reasonable or feasible to even construct noise barriers that would have the potential to afford a reasonable degree of protection to residences located north and south of the canyon. Because of the location of the residences below, adjacent to, and above the roadway both north and south of the canyon, it would appear that such barriers will not be reasonable or feasible and that noise levels will not be mitigatable. The statement that, "Residential exposures can be mitigated to City standards with reasonable offsite barriers" is without merit.

Page 16:

- **The sensitive habitat areas adjacent to the roadway, out to distances of several hundred feet, would potentially be exposed to noise levels exceeding 60 dBA L_{eq}.**

- **Traffic noise will cause a substantial increase in noise levels for a broad area within the canyon.**

The analysis of noise levels within Rose Canyon Open Space Park appears to be based upon limited noise measurements made near the Genesee Avenue Bridge. I visited the Genesee Avenue Bridge location and do not consider it a suitable example from which to build a model to assess the impacts of the Regents Road Bridge. Noise levels vary a lot depending upon the traffic signal operation at the entrance to the high school, so short-term measurements could either underestimate or overestimate actual conditions.

The new Federal Highway Administration Traffic Noise Model (TNM) is an appropriate traffic noise model to estimate noise levels from the new bridge. Figure 3.3-3 from the Draft EIR was used by us to conduct preliminary noise modeling for the Regents Road bridge. There would be two distinct noise environments within the canyon. One is the southern segment of the roadway where it is proposed to be on a cut and fill section . The other is thearea adjacent to and below the bridge section.

Noise levels adjacent to the cut and fill section will be similar to noise levels previously discussed: that is, a typical L_{eq} of 72 to 74 dBA at 50 feet at assumed speeds of 45 to 55 mph. Any sensitive habitat areas adjacent to the roadway, out to distances of several hundred feet, would potentially be exposed to noise levels exceeding 60 dBA L_{eq}.

The bridge section, as designed, will afford acoustical shielding to areas below and adjacent to the bridge. There will, however, be a substantial increase in traffic noise levels within the canyon. Typical background noise levels during our midafternoon measurements ranged from about 42 to 43 dBA in the absence of the intermittent Marine jet aircraft flights. Overall during the daytime, it is likely that noise levels currently range from about 40 to 50 dBA in the areas of the canyon below where the bridge would be, taking into account fluctuations in highway traffic noise due to speed, volume, and atmospherics. The unreported data from the Noise Study could confirm this. Our analysis indicates that traffic noise levels will range from 54 to 56 dBA on the canyon floor at distances of up to approximately 400 feet from the centerline of the bridge. Throughout most of the day, traffic noise levels above 50 dBA would dominate the noise environment within the canyon. Traffic noise from the proposed bridge will, therefore, cause a substantial increase in noise levels for a broad area within the canyon.

- **The analysis of potential noise impacts within the canyon is clearly inadequate.**

Detailed modeling should be completed and a thorough analysis of the potential effects of the noise from the project on the total noise environment must be discussed so that a decision maker has the information necessary to understand the potential adverse effects of this project on the noise environment.

VI. Comments on the Draft EIR Section 4.5 Noise

In general, the comments regarding the Appendix are also applicable to the Draft EIR noise section.

(1) The existing ambient noise environment along the Regents Road corridor is inadequately and incorrectly described. The section overstates existing ambient levels, thereby lessening the potential impacts.

(2) Future noise levels are not compared to existing noise levels as they should be under CEQA but rather to estimated future noise levels.

(3) Noise levels are not projected correctly for "future noise levels without the project" at sensitive receptors adjacent to Regents Road.

(4) The extent of the impact area is not described. Any receptor experiencing a substantial increase in noise as a result of the bridge should be within the region of influence. Arbitrarily defining the study area limits based on biological concerns, project limits, etc., could potentially miss significant numbers of affected receptors. The noise analysis itself must be used to determine where there would be a substantial increase and the numbers and types of affected receptors.

Conclusion

The Draft EIR noise section fails to correctly characterize existing ambient noise levels, predict future noise levels at sensitive receptors including residences and within Rose Canyon Open Space Park, evaluate the impacts with respect to CEQA guidelines, and evaluate the effectiveness of mitigation measures for both operational and construction noise. The noise study fails to provide a basis for a decision maker to make a decision regarding the significance of impacts and whether or not the impacts could be mitigated to a less-than-significant level.

Sincerely yours,

Richard B. Rodkin, PE
Illingworth & Rodkin, Inc.

RBR:gfl
(05-058)

Table 1
Ambient Noise Levels Measured
April 5, 2005 (10-Minute Duration)

Location	Start Time	L_{eq}	L_{max}	L_{01}	L_{10}	L_{50}	L_{90}	L_{min}
1) Regents Rd. @ Lahitte Ct. (north terminus) overlooking south canyon rim	11:40 am[1] 11:50 am	56 46	71 59	68 53	62 50	47 44	44 42	42 41
2) Regents Rd. @ Millikin one block south of Lahitte Ct.	12:10 pm[1]	54	70	65	57	48	45	42
3) Regents Rd. @ south terminus overlooking north canyon rim	2:07 pm	46	56	53	49	45	43	41
4) Regents Rd. @ Porte de Merano approx. 900 ft. north of south terminus	2:30 pm	52	59	58	54	51	49	48
5) Rose Canyon @ bottom just west of proposed bridge	3:05 pm[1] 3:15 pm	56 46	73 54	70 52	55 50	48 43	44 42	42 41

[1] Included Marine Corps jet takeoff lasting approximately 30 seconds.

Relative Sensitivities of Mammalian Carnivores to Habitat Fragmentation

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Abstract: *I examined the effects of habitat fragmentation on the distribution and abundance of mammalian carnivores in coastal southern California and tested the prediction that responses to fragmentation varied with the body size of carnivore species. I conducted track surveys for nine native and two exotic carnivore species in 29 urban habitat fragments and 10 control sites. Fragment area and isolation were the two strongest landscape descriptors of predator distribution and abundance. Six species were sensitive to fragmentation, generally disappearing as habitat patches became smaller and more isolated; three species were enhanced by fragmentation, with increased abundance in highly fragmented sites; and two species were tolerant of fragmentation, with little to no effect of landscape variables on their distribution and abundance. Within urban habitat fragments, the carnivore visitation rate increased at sites with more exotic cover and closer to the urban edge, a pattern driven largely by the increased abundance of fragmentation-enhanced carnivores at edge sites. Finally, body size, in conjunction with other ecological characteristics, partially accounted for the heterogeneity in responses to fragmentation among carnivore species. These differential sensitivities are useful criteria for choosing appropriate focal species for ecological research and conservation planning, a choice that depends on the scale of fragmentation in a region and the commensurate responses of carnivore populations at that scale.*

Sensibilidad Relativa a la Fragmentación del Hábitat de Mamíferos Carnívoros

Resumen: *Examiné los efectos de la fragmentación del hábitat sobre la distribución y abundancia de mamíferos carnívoros en la costa del sur de California y evalué la predicción de que las respuestas a la fragmentación variaban con el tamaño corporal de carnívoros. Se realizaron muestreos de huellas para nueve especies nativas y dos exóticas en 29 fragmentos de hábitat urbano y 10 sitios control. El área fragmentada y su aislamiento fueron los dos principales descriptores de la distribución y abundancia de depredadores. Seis especies fueron sensibles a la fragmentación, generalmente las especies desaparecían conforme los fragmentos eran más pequeños y aislados, tres especies fueron favorecidas por la fragmentación, con incremento en su abundancia en sitios altamente fragmentados, y dos especies fueron tolerantes a la fragmentación con poco o ningún efecto de las variables del paisaje sobre su distribución y abundancia. Dentro de los fragmentos de hábitat urbano, las tasas de presencia de carnívoros incrementaron en sitios con mayor cobertura exótica y cercanos al borde urbano, un patrón dirigido principalmente por el incremento en la abundancia de carnívoros favorecidos por la fragmentación en el borde de los sitios. Finalmente, el tamaño corporal, conjuntamente con otras características ecológicas, fueron parcialmente responsables de la heterogeneidad en respuestas a la fragmentación entre especies de carnívoros. Estas sensibilidades diferenciales son un criterio útil para seleccionar especies focales apropiadas para investigaciones ecológicas y la planeación de la conservación, una selección que depende de la escala de fragmentación en una región y de las respuestas apropiadas de las poblaciones de carnívoros a esa escala.*

Introduction

The destruction of habitat has been targeted as one of the most serious threats to biological diversity world-

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wide (Wilcove et al. 1998), and in areas with increasing urbanization, the loss and fragmentation of habitat is virtually inevitable. Mediterranean scrub habitats in coastal southern California are particularly threatened. Intensive development in the region over the past century has destroyed all but 10% of the native coastal sage scrub habitat (McCaull 1994). This habitat loss has created a "hotspot" of endangerment and extinction for the highly endemic biota in the region (Dobson et al. 1997). Mammalian carnivores are thought to be particularly vulnerable to local extinction in fragmented landscapes because of their relatively large ranges, low numbers, and direct persecution by humans (Noss et al. 1996; Woodroffe & Ginsberg 1998). The decline and extirpation of top predators from fragmented systems may generate trophic cascades that alter the structure of ecological communities (Crooks & Soulé 1999). Indeed, the persistence of these environmentally sensitive and ecologically pivotal species may be indicative of the integrity of entire ecosystems (Noss et al 1996). As such, mammalian carnivores can serve as useful tools for the study of ecological disturbances or for conservation planning and reserve design (Soulé & Terborgh 1999).

Mammalian predators are difficult to study, however, because of their low densities, nocturnal and secretive habits, and wariness of humans (Sargeant et al. 1998). As a result, the ecology of many carnivore species and their responses to ecological disturbances such as fragmentation are often poorly understood. Although considered members of the same ecological guild, carnivores may vary in their responses to fragmentation. In particular, differences in body size among carnivore species have been proposed as an important determinant of extinction probability (Brown 1986; Belovsky 1987). The relationship between body size and extinction risk in animals is complex, however, and has been the subject of considerable debate, with studies predicting and reporting positive, negative, or no relation of body size to extinction probability (reviewed by Johst & Brandl 1997). Few studies have evaluated if, how, or why carnivore species differ in their relative sensitivities to fragmentation effects.

My goal was to analyze the effects of the loss and fragmentation of habitat on mammalian carnivores in the urbanizing landscape of coastal southern California. Habitat fragmentation must be viewed as a multiscale problem, with fragmentation effects depending on the scale of fragmentation and the movement patterns of target species (Andren 1994). I therefore surveyed a suite of carnivore species that occur across a range of fragmentation levels and evaluated their responses to fragmentation at two spatial scales: (1) landscape-level heterogeneity among fragments and (2) local heterogeneity at sites within fragments. To allow for a more comprehensive assessment of relative sensitivities to fragmentation, I not only documented the presence or absence of each carnivore species, but also measured their relative abundance at each site. Finally, I tested the prediction that responses to fragmentation vary with body size in carnivore species, explored other ecological traits of these predators that may contribute to extinction risk, and used these differential sensitivities to evaluate the utility of mammalian carnivores as focal species with which to assess the degree of functional landscape connectivity.

Methods

Study Areas

I conducted carnivore surveys in 29 urban habitat fragments in coastal San Diego County from Fall 1995 through Summer 1997. Twenty-eight of these fragments were originally studied by Soulé et al. (1988). The fragments, completely surrounded by human-modified landscapes, are typically dendritic canyons dissecting coastal mesas, although a few also contain mesa-top habitat. The fragments support a mosaic of shrub habitat, including mixed chaparral, chamise chaparral, maritime succulent shrub, and coastal sage scrub, the dominant assemblage in most sites. Disturbed areas within fragments were typically dominated by ruderal weed species, ornamental plants invading from surrounding residences, fire-retardant ground cover such as South African iceplant (*Carpobrotus edulis*), and non-native trees (e.g., palms and species of *Eucalyptus* and *Acacia*) (Alberts et al. 1993).

From Fall 1995 through Summer 2000, I conducted carnivore surveys in less disturbed areas in coastal southern California to act as controls to the small, urban habitat remnants. These control areas varied in size and degree of isolation (Table 1), ranging from relatively small reserves isolated within urban developments (e.g., Point Loma Ecological Reserve) to large blocks of habitat relatively continuous with larger natural areas (e.g., Miramar Marine Corps Air Station).

Carnivore Surveys

I assessed the distribution and relative abundance of nine native and two non-native predator species through track surveys. Native species were the mountain lion (*Felis concolor*), bobcat (*Felis rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), badger (*Taxidea taxus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale gracilis*), and long-tailed weasel (*Mustela frenata*). Non-native target species were the domestic cat (*Felis catus*) and Virginia opossum (*Didelphis virginiana*), a marsupial introduced to California around 1910 (Jameson & Peeters 1988).

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Table 1. Landscape variables and distributions of 11 mammalian carnivore species for 10 control sites and 29 urban habitat fragments in coastal southern California (1, present; 0, absent).

	Area (ha)	*Age (yrs)*	*Distance Y (m)*	*Distance Z (m)*	*Long-tailed weasel*	*Spotted skunk*	*Badger*	*Mountain lion*	*Bobcat*	*Coyote*	*Gray fox*	*Striped skunk*	*Raccoon*	*Opossum*	*Domestic cat*
Control sites															
Miramar Marine Corps Air Station	5806	0	0	0	0	0	0	1	1	1	0	1	1	1	0
Chino Hills State Park	4452	0	200	200	1	0	1	1	1	1	1	1	1	1	0
Limestone Canyon/Whiting Ranch	4450	0	15	15	0	0	1	1	1	1	1	1	1	1	0
San Joaquin Hills	4219	22	5353	2930	0	1	0	0	1	1	1	1	1	1	0
Weir Canyon	1923	0	69	69	0	0	0	1	1	1	1	1	0	1	0
Santa Margarita Ecological Reserve	1763	0	30	30	0	0	0	1	1	1	1	0	1	0	0
Starr Ranch	1548	0	0	0	0	1	0	1	1	1	1	1	1	1	0
Tenaja	1191	0	0	0	1	0	1	1	1	1	1	1	1	1	0
Torrey Pines State Reserve	428	0	68	68	0	0	0	0	1	1	1	1	1	1	0
Point Loma Ecological Reserve	264	45	5700	5700	0	0	0	0	0	1	1	1	1	0	1
Urban fragments															
Florida	102	59	2100	233	0	0	0	0	0	1	1	0	0	0	0
Torrey Pines Extenstion	74	20	91	91	0	0	0	0	1	1	1	1	1	1	1
Balboa Terrace	56	43	121	117	0	0	0	0	0	1	1	1	1	1	1
Alta La Jolla	34	23	121	93	0	0	0	0	0	1	1	1	1	1	1
Kate Sessions	31	25	121	93	0	0	0	0	0	1	1	1	1	1	1
Zena	15	45	2865	467	0	0	0	0	0	1	1	1	0	1	1
Canon	12	67	1219	1167	0	0	0	0	0	0	1	1	1	1	1
Laurel	10	88	1554	350	0	0	0	0	0	1	1	1	1	1	1
32nd Street South	10	65	304	233	0	0	0	0	0	1	0	0	0	0	1
Pottery	10	23	45	70	0	0	0	0	0	1	1	1	1	1	0
Washington	9	83	365	187	0	0	0	0	0	1	1	1	1	1	1
Syracuse	9	27	40	70	0	0	0	0	0	1	1	1	0	1	1
Baja	8	40	670	70	0	0	0	0	0	1	1	1	1	1	1
Raffee	8	28	61	163	0	0	0	0	0	1	1	1	1	1	1
Solana	8	20	550	187	0	0	0	0	0	1	1	0	1	1	0
Acuna	7	31	110	47	0	0	0	0	0	1	1	1	0	1	1
Juan	7	32	228	70	0	0	0	0	0	1	1	1	1	1	1
Chollas	6	45	1005	467	0	0	0	0	0	1	1	1	1	1	1
Mil Cumbres	6	20	550	23	0	0	0	0	1	1	1	1	0	1	1
Chateau	6	29	110	47	0	0	0	0	0	1	1	0	0	1	1
Oak Crest	6	15	400	140	0	0	0	0	0	1	0	0	0	1	1
54th	4	29	609	187	0	0	0	0	0	1	1	1	1	1	1
60th	4	46	335	350	0	0	0	0	0	1	0	0	0	1	0
Spruce	4	95	1767	93	0	0	0	0	0	1	1	1	1	1	1
Titus	3	86	280	163	0	0	0	0	0	1	1	1	1	1	1
Montanosa	3	11	91	93	0	0	0	0	0	1	0	0	0	1	1
El Mac	2	41	883	163	0	0	0	0	0	1	1	1	1	0	1
Poinsettia	2	59	350	350	0	0	0	0	0	0	1	0	1	1	1
Talbot	2	64	1219	933	0	0	0	0	0	0	1	1	1	1	1
Urban fragment occupancy					0	0	0	0	2	26	25	21	19	26	25
Total occupancy					2	2	3	7	11	36	34	30	28	34	26

I established a series of track-detection stations at approximately 250-m intervals along dirt roads or trails (human and/or wildlife) along the main axis of each study area (Linhart & Knowlton 1975; Conner et al. 1983; Sargeant et al. 1998). Each track station consisted of a 1-m-diameter, 1-cm-deep, circle of freshly sifted gypsum baited with a liquid carnivore scent lure (Russ Carman's Pro-Choice and Canine Call, Sterling Fur & Tool, Sterling, Ohio) every other day. Track transects were checked and reset daily for 5 consecutive days. Tracks on each station were measured and identified to species; tracks with ambiguous identifications were omitted from analyses. Track surveys were conducted once each sampling quarter: fall (September–November), winter (December–February), spring (March–May), and summer (June–August). Each site was sampled for 1–2 years.

The track index of each carnivore species in each quarterly sampling session was expressed as the total number of visits recorded for a species, divided by the total sampling effort. I defined a visit as at least one track of a species on a track station (Conner et al. 1983). Mathematically, the track index (I) was calculated as

$$I = \ln[\{v_j/(s_j n_j)\} + 1],$$

where v_j is the number of stations visited by a species in transect j, s_j is the number of stations in transect j, and n_j is the number of nights that stations were operative in transect j. Thus, I for each species represents the visitation rate per track station per night in each study area. Although this index cannot be directly translated into numbers of individuals and hence does not measure absolute densities, it does provide an index of the relative abundance of a species at each sampling point (Conner et al. 1983; Sargeant et al. 1998). For each species, I averaged track indices across quarterly sampling sessions to derive a mean index at each study area for the duration of the study. Indices were log-transformed to meet normality assumptions in the statistical analyses. Overall, track surveys totaled 6540 station-nights ($s_j n_j$) among all study sites.

Landscape Variables

I used area, age, and isolation to assess the effects of landscape-level fragmentation on carnivore populations (Table 1). I measured the total area of each fragment based on digitized images of scaled aerial photographs taken in 1995. Total area of each control site was defined as the reserve boundaries within which the surveys were conducted. Because control sites were often adjacent to unfragmented habitat, area approximations represent minimum estimates.

Fragment age, defined as the number of years since isolation of the habitat fragment by urban development, was based on dated aerial photographs and building permit records (Soulé et al. 1988). Because fragment age is highly negatively correlated to the proportion of native shrub cover within fragments (Suarez et al. 1998; Crooks et al. 2001), I used age to measure a time effect per se in the fragments and to represent the cumulative loss of native habitat in the entire fragment since isolation. Age was scored as zero for control sites that were directly adjacent to larger natural areas (Miramar Marine Corps Air Station, Starr Ranch Audubon Sanctuary, Tenaja Corridor) or that were separated from such areas by only a roadway and not by urban development (Chino Hills State Parks, Limestone Canyon/Whiting Ranch, Santa Margarita Ecological Reserve, Torrey Pines State Reserve, Weir Canyon).

Two variables were calculated to characterize the degree of isolation of each site: distance Y, the distance to the closest habitat patch (measured from patch edge to patch edge) of equal or larger size (Soulé et al. 1988), and distance Z, the shortest distance to any other habitat fragment, reserve, or possible movement linkage to such sites (e.g., riparian channels, power line easements, golf courses). Isolation was scored as zero for control sites directly adjacent to a larger natural area and as the width of the roadway for control sites isolated from larger habitat blocks by a roadway.

All landscape variables were log-transformed to meet normality assumptions in the statistical analyses. When only the urban habitat fragments were considered, fragment age was positively related to distance Y ($r = 0.564$, $p = 0.001$) and distance Z ($r = 0.526$, $p = 0.003$), and distance Y was positively related to distance Z ($r = 0.362$, $p = 0.053$). When both habitat fragments and control areas were included, area was negatively related to age ($r = -0.813$, $p < 0.001$), distance Y ($r = -0.467$, $p = 0.003$), and distance Z ($r = -0.299$, $p = 0.065$); age was positively related to distance Y ($r = 0.741$, $p < 0.001$) and distance Z ($r = 0.597$, $p < 0.001$); and distance Y was positively related to distance Z ($r = 0.761$, $p < 0.001$).

SPECIES RICHNESS AND DISTRIBUTION

Island biogeography theory predicts that landscape variables such as size and isolation should help determine the number of species on islands (MacArthur & Wilson 1967). To test this prediction, I calculated two measures of carnivore species richness for each study area: (1) the number of carnivore species detected at the site during the course of the study and (2) the number of native carnivore species detected, excluding the non-native opossum and domestic cat. A species was present in a study area if it was detected on track stations within the site at least once during the course of the study. Presence was verified with a combination of remotely triggered cameras, scat surveys, and opportunistic visual sightings. Presence of a species does not necessarily imply that the site can support resident animals or populations. Like-

wise, failure to detect a species at a site does not indicate that the species has never visited the area, but rather that it was not recorded during sampling sessions.

I used backward-elimination multiple regression to identify which landscape variables (size, age, and isolation) were the best predictors of carnivore species richness in a study site. Independent variables with $p < 0.15$ were included in all regression models to minimize exclusion of important predictors from the model, and tolerance values were set at 0.10 throughout to control for multicollinearity (Tabachnick & Fidell 1996). Comparison-wide error rates were examined in all statistical analyses (Mead 1988; Stuart-Oaten 1995) ($p < 0.05$, statistically significant; $0.05 < p < 0.10$, marginally significant). I first conducted the multiple-regression analyses including only the 29 urban habitat fragments and then including all 39 study sites.

I used logistic-regression analyses to evaluate the effect of landscape variables on the distribution of individual carnivore species. First, I constructed bivariate logistic-regression models to evaluate the separate effects of area and isolation (distance Z) on the probability of occurrence for each species across all 39 study sites. Area and distance Z were chosen because preliminary analyses indicated that they were the two strongest predictors of carnivore distribution. For species with significant area and isolation effects, I plotted logistic-regression curves of the probability of occurrence of each species as a function of area, holding isolation constant by substituting its median value into a two-way (area × isolation) logistic model. Likewise, I constructed isolation curves after holding area constant by substituting its median value into the two-way logistic model. From these curves, I calculated the area and isolation at which the probability of occurrence of the species equaled 50% and used these estimates to represent the relative area and isolation requirements for each species (following Crooks et al. 2001). Finally, I used multiple-logistic-regression models to graphically evaluate the combined effect of area and isolation on probability of occurrence for each species.

Logistic-regression estimates of probability of occurrences and relative area and isolation requirements are not intended, however, to represent the actual fragment size or isolation necessary to ensure the long-term persistence of a population (Hinsley et al. 1996). Rather, probability of occurrence measures the probability of an individual visiting the study area at least once during the course of the study, and the area and isolation estimates generated are intended to function only as relative indices of sensitivity to fragmentation. Area and isolation estimates are likely to be more accurate for those species with the most detections.

RELATIVE ABUNDANCE

I used backward-elimination regression models to identify which landscape variables were the best predictors of the track indices of each species in each study area. The analyses were first conducted including only the 29 urban habitat fragments. Mountain lions, spotted skunks, badgers, and long-tailed weasels were omitted from these analyses because they were not detected in any urban habitat fragments. Bobcats, detected in only two fragments, were also omitted.

I repeated the multiple-regression analyses across all 39 fragments and control sites, including mountain lions and bobcats in the analyses. Spotted skunks, badgers, and long-tailed weasels were again omitted due to low detection rates. Because the track indices for mountain lions and bobcats were zero for many sites, the results of these regressions must be interpreted with caution. The final regression models were determined largely by the patterns of species' presence or absence across sites and not by variation in relative abundance among sites where they occurred. Nevertheless, I report regression models for mountain lions and bobcats to allow for further evaluation of the effects of landscape variables on these species and for further comparisons of their fragmentation sensitivities to those of other carnivore species.

Local Variables

Habitat heterogeneity within these urban habitat fragments is an important determinant of the persistence of native scrub-breeding birds (Soulé et al. 1988), rodents (Bolger et al. 1997), and invertebrates (Suarez et al. 1998; Bolger et al. 2000), all potential prey for carnivore species. I measured three variables to investigate the effect of habitat heterogeneity on carnivore populations: distance to the urban edge, percent cover of native shrubs, and percent cover of exotic vegetation. I estimated the distance of each track station to the nearest urban edge (the backyards of the houses bordering the fragment) and log-transformed these values to meet normality assumptions in the statistical analyses. I used a Braun-Blanquet categorical scale (Kent & Coker 1992) to estimate the percent cover of native shrubs and of total exotic cover within a 20-m radius around each track station. The cover scale was 0 (<1%), 1 (1–5%), 2 (6–25%), 3 (26–50%), 4 (51–75%), and 5 (76–100%). Distance to edge was positively related to shrub cover ($r = 0.281$, $p = 0.007$) and negatively related to exotic cover ($r = -0.341$, $p = 0.001$), and shrub cover was negatively related to exotic cover ($r = -0.694$, $p < 0.001$).

SPECIES RICHNESS AND RELATIVE ABUNDANCE

I calculated the total number of carnivore species and the number of native carnivore species detected at each track station in the 29 urban habitat fragments during the course of the study; two exotic species (opossum and domestic cat) and five native species (bobcat, coyote, gray fox, striped skunk, and raccoon) were detected

in the urban fragments and were hence included in the analyses. I then used backward-elimination multiple regression to identify which local variables were the best predictors of carnivore species richness at each station.

I calculated the mean track index for each species at each track station in the 29 urban habitat fragments to generate relative abundance indices. Again, mountain lions, spotted skunks, long-tailed weasels, badgers, and bobcats were omitted from these analyses due to low detection rates within fragments. I then used backward-elimination multiple regression to identify which local variables were the best predictors of the relative abundance of each species at a station. Some species were absent from some fragments, however, an absence driven in part by landscape variables such as area, age, and isolation. I therefore conducted the regressions for each species after excluding from the analyses all fragments where that species was never detected. By excluding these fragments I could account for the effects of landscape-level fragmentation on the presence or absence of a species and therefore more fully analyze the effects of local variables within fragments where that species occurred.

To further evaluate the effect of the urban edge on carnivores within fragments, for each species I graphed the mean track index at each station as a function of the distance of that station from the urban edge. Edge distances were classified into five categories: 0–24 m (n = 14 stations), 25–49 m (n = 35), 50–99 m (n = 16), 100–199 (n = 19), and >200 m (n = 7). Direct comparisons of track indices between species can be misleading, because the response of species to track stations may differ (Conner et al. 1983; Sargeant et al. 1998). To allow for more meaningful comparisons of track indices, I standardized the index for each species by dividing each value by the maximum track index recorded for that species. Therefore, these standardized track indices for each species ranged on a scale of 0 to 1.

Body Size and Fragmentation Sensitivity

I evaluated the relationship between body mass and sensitivity to fragmentation among carnivore species through linear-regression analysis. As an index of sensitivity to fragmentation, I calculated the average area of study sites occupied by each species, multiplying the area of each study site by the standardized track index (scale 0 to 1) of that species at that site. With area weighted by relative abundance per sampling point, the indices accounted not just for occupancy but also for differences in the relative abundance of a species among study sites. For example, for a given species, some study sites supported resident populations, whereas other study sites were only visited temporarily during the course of the study. Average area weighted by relative abundance accounted for such differences. In addition, I also compared body mass to typical home-range sizes and population densities reported in the literature for these species.

Results

Landscape Heterogeneity: Comparisons among Fragments

SPECIES RICHNESS AND DISTRIBUTION

The distribution of carnivore species varied across study sites (Table 1). Coyotes, opossums, gray foxes, domestic cats, striped skunks, and raccoons were detected in most urban fragments. Bobcats were detected in 9 of the 10 control sites but in only 2 urban habitat fragments, and mountain lions were detected in only 7 control sites and no urban fragments. I recorded few to no visits of mountain lions and bobcats in the habitat fragments, despite higher sampling intensity per unit area (station-nights/total area of site) in the 29 fragments (mean = 8.30 station-nights/ha, SE = 0.910) than in the 10 control sites (mean = 0.43 station-nights/ha, SE = 0.158) (t = 4.58, $p < 0.001$). Detections of spotted skunks, long-tailed weasels, and badgers were rare and occurred only in the larger habitat blocks.

Among the 29 urban habitat fragments, no landscape variables were retained as predictors of the total number of carnivore species in backward-elimination regression models (Table 2). When the opossum and domestic cat were excluded, however, the species richness of native carnivores exhibited a weak negative trend with fragment isolation (distance Z) and a weak positive trend with fragment age. When control sites were included in the analyses, both total carnivore species richness and native carnivore species richness increased with the area of the study site.

Logistic-regression models for each species indicated that the probability of occurrence across all sites was positively related to fragment area for coyotes (χ^2 = 5.57, p = 0.018), bobcats (χ^2 = 29.85, $p < 0.001$), mountain lions (χ^2 = 27.35, $p < 0.001$), spotted skunks (χ^2 = 5.85, p = 0.016), long-tailed weasels (χ^2 = 5.37, p = 0.021), and badgers (χ^2 = 9.73, p = 0.002). In contrast to these native carnivores, the probability of occurrence of domestic cats was higher in smaller fragments (χ^2 = 22.63, $p < 0.001$). Area was not a significant predictor of probability of occurrence for gray foxes (χ^2 = 0.24, p = 0.627), striped skunks (χ^2 = 1.81, p = 0.178), raccoons (χ^2 = 2.02, p = 0.155), or opossums (χ^2 = 0.357, p = 0.550).

Logistic-regression models indicated that probability of occurrence across all sites decreased with fragment isolation (distance Z) for coyotes (χ^2 = 6.92, p = 0.008), bobcats (χ^2 = 11.57, $p < 0.001$), and mountain lions (χ^2 = 11.88, $p < 0.001$). In contrast, probability of oc-

Table 2. Backward-elimination regression models of the effects of landscape variables on carnivore species richness and relative abundance among 29 urban habitat fragments and 10 control sites in coastal southern California.[a]

Variables	R^2	*Whole-model* p	*Coefficient*	p
Urban habitat fragments				
total species richness				
n.s.[b]				
native species richness	0.146	0.129		
distance *Z*			−0.408	0.067
age			+0.374	0.091
coyote	0.133	0.052		
area			+0.365	0.052
gray fox	0.114	0.074		
area			−0.336	0.074
domestic cat	0.393	0.002		
area			−0.550	0.001
distance *Z*			+0.246	0.122
opossum	0.164	0.029		
area			−0.405	0.029
striped skunk				
n.s.				
raccoon				
n.s.				
All sites				
total species richness	0.194	<0.001		
area			+0.440	<0.001
native species richness	0.372	<0.001		
area			+0.610	<0.001
coyote	0.15	0.015		
area			+0.388	0.015
bobcat	0.595	<0.001		
age			−0.921	<0.001
distance *Y*			+0.607	0.004
distance *Z*			−0.376	0.030
mountain lion	0.277	<0.001		
age			−0.526	<0.001
gray fox	0.197	0.005		
area			−0.444	0.005
raccoon	0.081	0.081		
area			−0.284	0.081
domestic cat	0.335	<0.001		
area			−0.579	0.001
opossum	0.241	0.002		
area			−0.491	0.002
striped skunk				
n.s.				

[a]*Independent variables are fragment area, age, and isolation (distance Y and distance Z). Independent variables with* $p < 0.15$ *were included in the final regression models.*
[b]*No independent variables were retained in the regression model* ($p > 0.15$); *n.s., not significant.*

currence was higher in more isolated fragments for domestic cats ($\chi^2 = 4.25$, $p = 0.039$). Isolation was not a significant predictor of probability of occurrence for gray foxes ($\chi^2 = 0.35$, $p = 0.553$), opossums ($\chi^2 = 1.88$, $p = 0.171$), spotted skunks ($\chi^2 = 0.18$, $p = 0.671$), striped skunks ($\chi^2 = 0.69$, $p = 0.407$), raccoons ($\chi^2 = 0.06$, $p = 0.811$), long-tailed weasels ($\chi^2 = 1.74$, $p = 0.187$), or badgers ($\chi^2 = 2.62$, $p = 0.106$).

After I controlled for isolation effects, the estimated area at which probability of occurrence was 50% was 1 ha for coyotes, 1.8 km^2 for bobcats, and 23 km^2 for mountain lions (Fig. 1a). The probability of occurrence for domestic cats dropped below 50% in fragments larger than 1.4 km^2; cats were never detected in the interior of control sites, and few if any feral cats occurred in these sites.

After I controlled for area effects, the estimated fragment isolation (distance *Z*) at which probability of occurrence was 50% was 883 m for coyotes and 6 m for bobcats (Fig. 1b). The probability of occurrence for mountain lions was <50% across the entire isolation range of fragments. In contrast, the probability of occurrence for domestic cats was >50% across the entire range of fragment isolation.

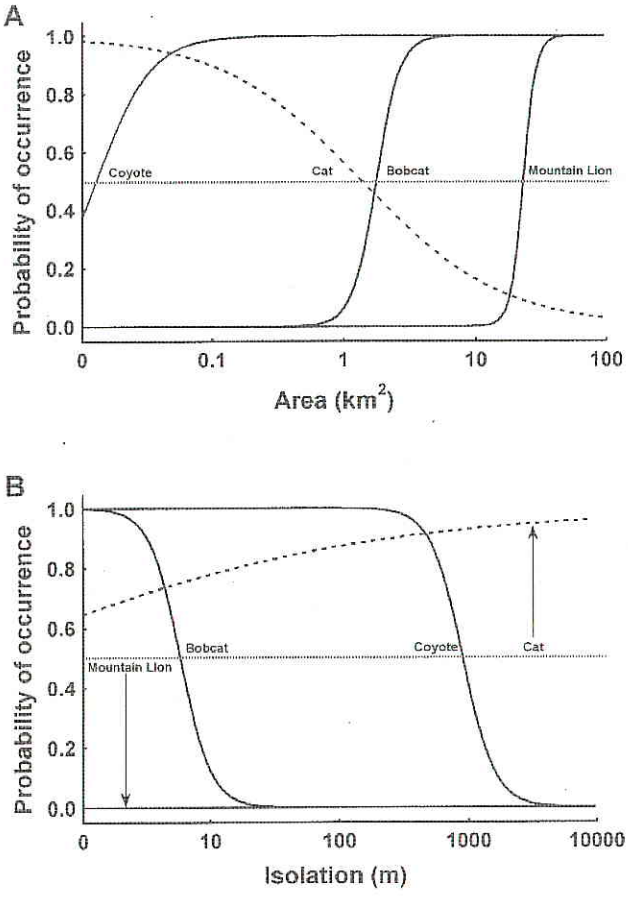

Figure 1. Logistic-regression models of the probability of occurrence of native (solid lines) and exotic (dashed line) carnivores as a function of (a) fragment area and (b) isolation. Area and isolation curves were constructed after the other independent variable was held constant by substituting its median values into a two-way (area × isolation) logistic-regression model. Only species with significant area and isolation effects are presented. Dotted line represents 50% probability of occurrence.

Multiple logistic-regression models of the combined effect of area and isolation on mountain lions, bobcats, and coyotes generated "extinction surfaces" that consisted of plateaus of occupancy at larger and less isolated sites that declined to basins of local extinctions at small and isolated fragments (Fig. 2). The effect of the area-isolation interaction, and hence the contour of the extinction surfaces, varied among species. The plateau for mountain lions was small and occurred only in the largest unfragmented sites, with large basins across all other study areas. The plateau for bobcats spanned a wider range of sites, but probability of occurrence dropped to zero in sites that were both small and isolated. Bobcats occurred in relatively small sites, but only those with little to no isolation. The plateau of coyotes was large, with a low probability of occurrence in only the smallest, most isolated urban fragments. Domestic cats exhibited a surface that was the inverse of these native predators. Their probability of occurrence was high in small and isolated fragments but lower in larger, less fragmented sites.

It should be emphasized, however, that the probability of residency or long-term viability of populations is undoubtedly lower than these probabilities of occurrence, particularly in smaller and isolated sites. For example, coyotes visited some fragments only temporarily during the course of the study. In some quarterly sampling sessions they were detected and in others they were not. Although the plateau of occupancy for coyotes encompassed most combinations of area and isolation, residency declined with fragment area. The average area of the 13 fragments in which coyotes came and went (mean = 0.75 [5.6 ha back-transformed], SD = 0.20) was smaller ($t = 3.01$, $p = 0.006$) than the average area of the 13 fragments in which coyotes were detected in every quarterly sampling session (mean = 1.19 [15.6 ha back-transformed], SD = 0.95).

RELATIVE ABUNDANCE

When only the 29 urban habitat fragments were included in the analyses, the relative abundance of coyotes at each sampling point was higher in larger fragments, whereas track indices of gray foxes, domestic cats, and opossums were higher in smaller fragments (Table 2). No variables were retained in the final model for raccoons and striped skunks ($p > 0.15$).

When control sites were also included in the regressions, coyote track indices at each sampling point again tended to be higher in larger sites. In contrast, the track indices of gray foxes, domestic cats, opossums, and raccoons were higher in smaller sites (Table 2). No landscape variables were retained in the models for the relative abundance of striped skunks.

When control sites were included in the regression models, fragment age was retained as the most significant predictor of the relative abundance of mountain lions and bobcats (Table 2); both species were less abundant in older sites. Mountain lions and bobcats were detected in relatively few sites, most of which were control areas not isolated by urban development (age = 0) and, for bobcats, a couple of recently isolated fragments (Table 1). This pattern generated the significant, negative slope between relative abundance and age for the two species.

The relative abundance of bobcats decreased with distance to the nearest movement linkage or natural area (distance Z) but, paradoxically, increased with distance to the nearest habitat patch of equal or larger size (distance Y). Bobcats were detected at sites that were relatively distant from larger natural areas (high values of

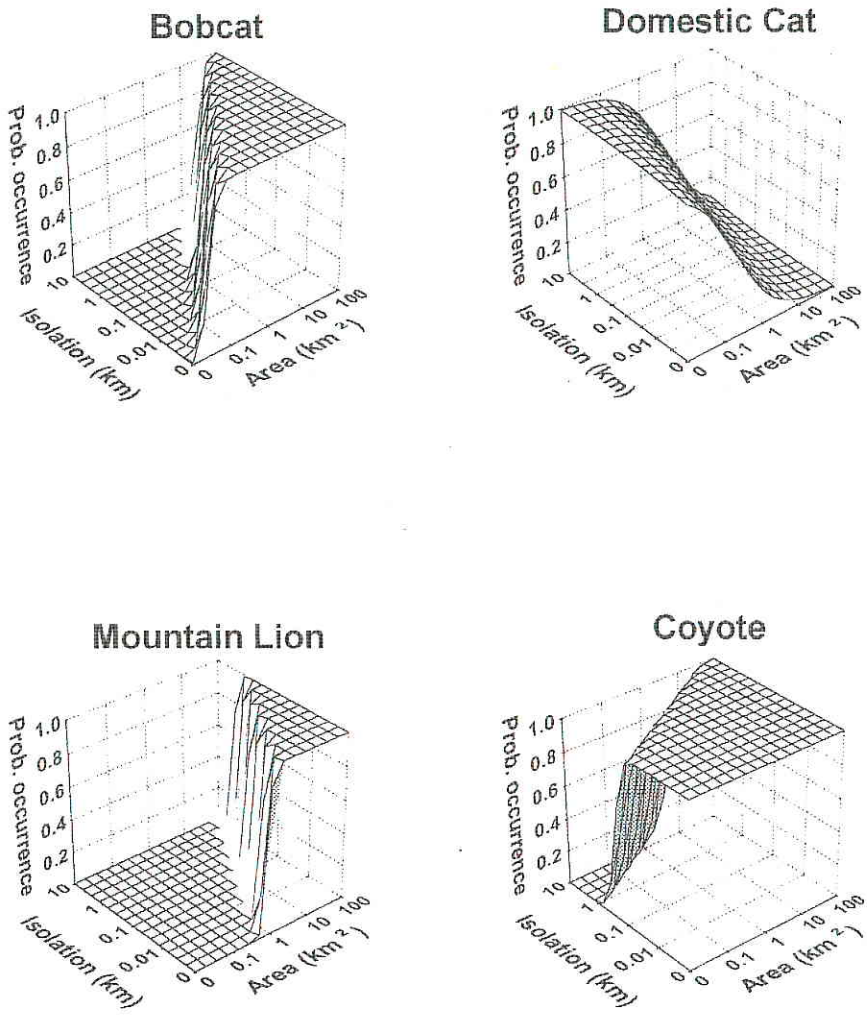

Figure 2. Multiple logistic-regression models of the probability of occurrence of mountain lions, bobcats, coyotes, and domestic cats as a function of fragment area and isolation. Only species with significant area and isolation effects are presented.

distance Y), but only if they were large or were near movement linkages to larger habitat blocks (low value of distance Z). For example, bobcats have persisted in the San Joaquin Hills, an isolated (distance Y = 5353 m) but large (4219 ha) habitat block. Bobcats were also detected in Mil Cumbres, a small (6 ha) urban fragment that was isolated from larger natural areas (distance Y = 550 m) but that was near a golf course (distance Z = 23 m), which likely served as a movement linkage to natural areas to the east.

Local Heterogeneity: Comparisons within Fragments

SPECIES RICHNESS AND RELATIVE ABUNDANCE

The number of carnivore species detected was greater at track stations closer to the urban edge (Table 3). This pattern was largely determined by non-native species. When exotic predators (domestic cats, opossums) were excluded from the analyses, the number of native species detected at each station did not vary significantly with any local variables.

The relative abundance of gray foxes and opossums was higher at track stations near the urban edge within fragments where each species occurred (Table 3). The abundance of domestic cat exhibited a weak negative trend with distance to urban edge. The relative abundance of striped skunks tended to be higher at greater distances from the urban edge. Domestic cats and raccoons tended to be more abundant at stations with more exotic cover. No local variables entered the model for the relative abundance of coyotes.

A graphical analysis revealed that the coyote rate of visitation to track stations was high both near the urban edge and into the interior of the urban habitat fragments (Fig. 3). The abundance of striped skunks also was relatively high in the interior of fragments. In contrast, the abundance of opossums, gray foxes, domestic cats, and raccoons was relatively high within 50 m from urban development, but then tended to decline into the interior of the habitat fragment.

Body Size and Fragmentation Sensitivity

When all species were included in the regression, the relationship between body mass (Table 4) and the average

Table 3. Backward-elimination regression models of the effects of local habitat variables on carnivore species richness and relative abundance at 92 track stations within 29 urban habitat fragments in southern California.[a]

Variables	R^2	*Whole-model* p	*Coefficient*	p
Total species richness	0.049	0.036		
edge			−0.222	0.036
Native species richness				
n.s.[b]				
Coyote (87 stations)				
n.s.				
Gray fox (85)	0.146	<0.001		
edge			−0.382	<0.001
Striped skunk (69)	0.042	0.095		
edge			0.205	0.095
Raccoon (62)	0.056	0.066		
exotic			0.237	0.066
Domestic cat (73)	0.143	0.005		
exotic			0.242	0.057
edge			−0.205	0.105
Opossum (79)	0.079	0.013		
edge			−0.281	0.013

[a]*Independent variables are distance to urban edge, native shrub cover, and total exotic cover. Independent variables with* $p < 0.15$ *were included in the final regression models. For each species, stations were included only in analyses for those fragments where the species was detected.*

[b]*No independent variables were retained in the regression model* ($p > 0.15$)*; n.s., not significant.*

area of study sites occupied by each carnivore species, weighted by the standardized track index of each species at each site, was not significant ($r = -0.392$, $p = 0.233$) (Fig. 4a). Spotted skunks, long-tailed weasels, and badgers, however, appeared to be outliers to an otherwise positive relationship between body size and average area of sites occupied. When these three species were excluded from the regression, the positive relationship was significant ($r = 0.725$, $p = 0.042$). Body mass was also positively related to typical home-range sizes (Fig. 4b: $r = 0.720$, $p = 0.012$) and negatively related to typical population densities (Fig. 4c: $r = -0.705$, $p = 0.015$) recorded for these species (Table 4).

Discussion

Landscape Heterogeneity and Carnivore Populations

Fragment area and isolation were the two strongest landscape predictors of predator distribution and abundance. Badgers, long-tailed weasels, spotted skunks, mountain lions, bobcats, and coyotes appear to be the species most sensitive to fragmentation, with a lower probability of occurrence and relative abundance per unit area in smaller and more isolated habitat patches. In contrast, the probability of occurrence and relative abundance of domestic cats, gray foxes, and opossums tended to decrease with fragment area and increase with fragment isolation. Landscape descriptors had relatively little effect on the distribution and abundance of raccoons and striped skunks. Because some carnivores were fragmentation-sensitive, some fragmentation-enhanced, and some fragmentation-tolerant, landscape variables appear to affect species composition more than species richness.

The probability of occurrence of mountain lions, bobcats, and coyotes declined in sequence as habitat patches became smaller and more isolated (Fig. 1). Because mountain lions, bobcats, and coyotes generally occurred in fragments above some threshold of size and isolation, local extinctions of their populations in a fragmenting landscape appear deterministic and predictable (Brown 1986). Such thresholds also suggest that, depending on the species and the degree of fragmentation, a single large reserve would have a higher probability of supporting populations of these predators than archipelagos of similar but smaller isolates (Soulé & Simberloff 1986). For example, our models predict that the probability of occurrence of bobcats will be low in 10 1-km^2 isolates but higher in a 10-km^2 reserve, and that the probability of occurrence of mountain lions will be low in 10 10-km^2 isolates but higher in a 100-km^2 reserve (Fig. 1).

Unlike true islands, habitat patches are part of a landscape mosaic, and the presence of a given species in a patch may be a function not only of patch size and isolation, but also of how the species perceives the intervening matrix (Andren 1994; Rosenblatt et al. 1999). In previous studies in this system, fragment age and area were the most important landscape predictors of the distribution and abundance of native plants (Alberts et al. 1993), scrub-breeding birds (Soulé et al. 1988; Crooks et al. 2001), rodents (Bolger et al. 1997), and invertebrates

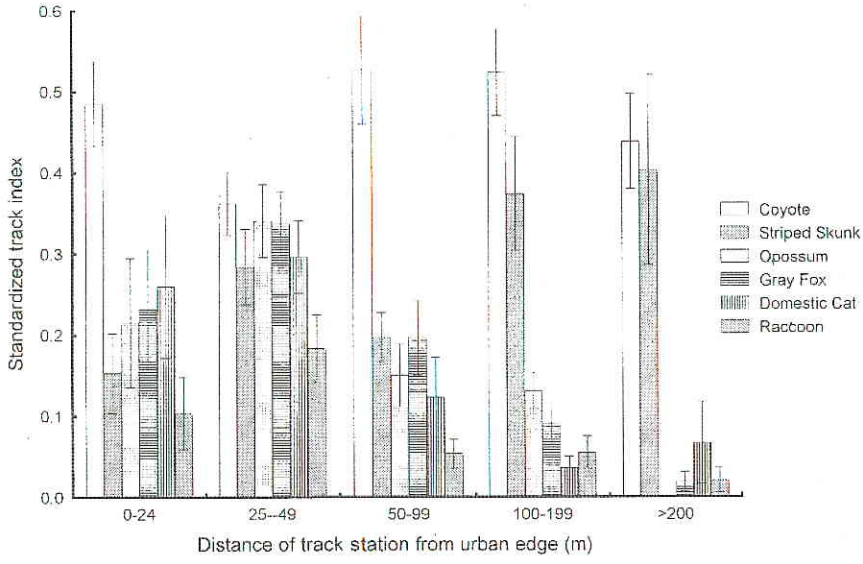

Figure 3. Track indices of carnivore species within urban habitat fragments as a function of the distance of the station from the urban edge. Track indices are standardized for each species.

(Suarez et al. 1998; Bolger et al. 2000). With limited exceptions, isolation effects were absent for these species, likely due to their strict habitat requirements and low dispersal capabilities (Soulé et al. 1992). For these taxa, little to no dispersal across developed areas resulted in complete isolation once fragmentation had occurred, with the fragments operating as true islands immersed within a relatively inhospitable matrix. My results also indicate that fragment isolation was not a strong predictor of the distribution and abundance of human-tolerant mesopredators, although the causal mechanisms differed. Unlike many native scrub-breeding birds, rodents, and invertebrates, mesopredator species such as raccoons, striped skunks, opossums, and domestic cats move through and reside within developed areas and thus perceive the urban matrix as somewhat permeable. High rates of movement through the matrix within which fragments are embedded should also minimize the effects of fragment isolation.

Local Heterogeneity and Carnivore Populations

Within the urban fragments, exotic cover and distance to the urban edge were the strongest local predictors of carnivore distribution and abundance. These two variables were correlated, with more exotic cover and less native shrub cover closer to the urban edge. Previous studies have found that scrub-breeding birds (Soulé et al. 1988), rodents (Bolger et al. 1997), and invertebrates (Suarez et al. 1998; Bolger et al. 2000) require native vegetation to persist in these fragments. Unlike many of these species, however, the mammalian carnivores detected in the habitat fragments are resource generalists that likely benefit from the supplemental food resources

Table 4. Ecological characteristics of mammalian carnivores detected in coastal southern California.[a]

Species	*Weight (kg)*	*Home range (km²)*	*Density (km²)*	*Reference*
Mountain lion	69.5 (36.0–103.0)	492 (112–829)	0.027 (0.005–0.048)	Beier & Barrett 1993; Nowak 1999
Coyote	13.5 (7.0–20.0)	5.69 (0.66–11.96)	0.3 (0.2–0.4)	Nowak 1999; Sauvajot et al. 2000
Bobcat	9.7 (4.1–15.3)	2.94 (0.24–5.63)	1.34 (1.15–1.53)	Lembeck 1986; Nowak 1999
Badger	8.0 (4–12)	2.0 (1.6–2.4)	2.70 (0.39–5.0)	Messick 1987; Nowak 1999
Raccoon	7.0 (2.0–12.0)	0.52 (0.39–0.65)	11.2 (2.3–20.0)	Nowak 1999
Gray fox	4.4 (1.8–7.0)	0.69 (0.22–1.87)	5.2 (0.4–10.0)	Nowak 1999; Riley 1999
Domestic cat[b]	3.9 (3.3–4.5)	0.40 (0.001–3.80)	150 (2–500)	Barratt 1997; Nowak 1999
Opossum	3.8 (2.0–5.5)	0.20 (0.05–2.54)	26 (2–116)	Nowak 1999
Striped skunk	1.6 (0.7–2.5)	0.21 (0.11–0.37)	3.3 (1.8–4.8)	Nowak 1999
Spotted skunk	0.6 (0.2–1.0)	0.49 (0.34–0.65)	24.4 (8.8–40)	Crooks & Van Vuren 1995; Kinlaw 1995; Nowak 1999
Long-tailed weasel	0.2 (0.09–0.34)	0.62 (0.04–1.20)	19.4 (0.38–38)	Nowak 1999

[a]Estimates of body size, home range, and population density vary considerably (Nowak 1999). Values are typical averages and ranges (in parentheses). If no average estimate was provided, median values, calculated from the ranges, are presented. Body-mass estimates were taken from Nowak (1999). Where available, home ranges and population densities were taken from studies conducted in California.
[b]Estimates include studies from suburban, urban, rural, and island cat populations.

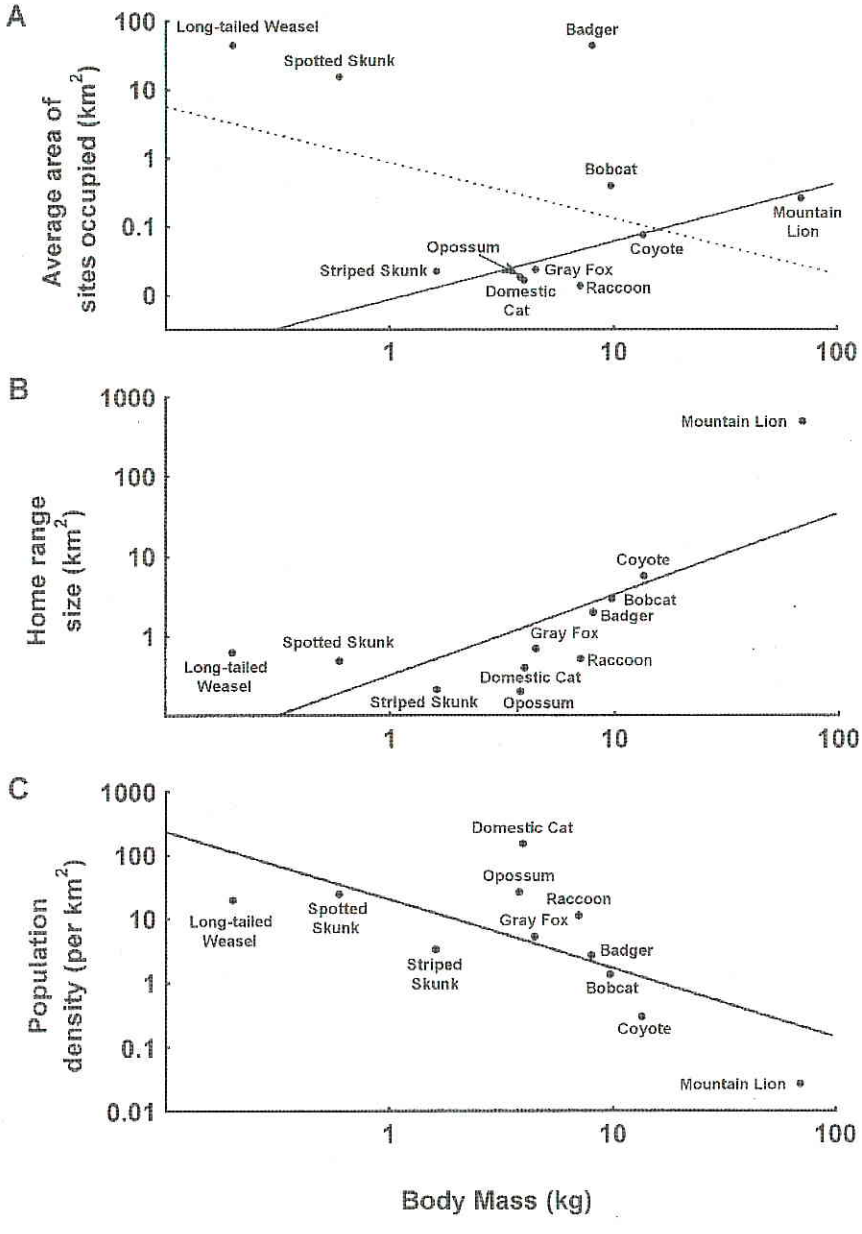

Figure 4. Relationship between log body mass and (a) log average area of sites occupied by mammalian carnivores, weighted by the relative abundance of each species at each site, (b) log home-range size (r = 0.720, p = 0.012; see Table 4 for values), and (c) log population density (r = −0.705, p = 0.015; see Table 4 for values). Dotted line in (a) is the least-squares regression fit including all species in the analysis (r = −0.392, p = 0.233), and the solid line in (a) is the regression excluding spotted skunks, long-tailed weasels, and badgers (r = 0.725, p = 0.042).

(e.g., garden fruits and vegetables, garbage, direct feeding by humans) associated with residential developments. As a result, the carnivore visitation rate actually increased at sites with more exotic cover and closer to the urban edge, a pattern determined largely by the increased abundance of fragmentation-enhanced mesopredators (gray foxes, opossums, and domestic cats) at edge sites within habitat fragments. Although some carnivores within the habitat fragments seem tolerant of disturbance, these fragments have already lost an entire suite of predator species, including mountain lions, bobcats, spotted skunks, long-tailed weasels, and badgers. Furthermore, the habitat fragments are relatively small (<100 ha), so the most "interior" sites within the fragments are still relatively near (<250 m) urban edges.

Unlike true islands, "edge effects" that emanate from the human-dominated matrix can increase the extinction probability of isolated populations (Murcia 1995; Woodroffe & Ginsberg 1998). Human-tolerant mesopredators in southern California represent such an edge effect. They occur within the developed matrix, are more abundant along the edges of habitat fragments, and are effective predators on birds, bird nests, and other vertebrates in this system and elsewhere (Crooks & Soulé 1999). Several factors likely account for increased numbers and activity of mesopredators in disturbed landscapes. Residential developments represent suitable habitat for some mesopredator species whose distributions are closely associated with human-dominated landscapes (Donovan et al. 1997). In addition to

habitat suitability, however, dominance interactions between carnivores affect mesopredator populations. When large, dominant predators disappear in fragmented systems, smaller, subordinant predators can subsequently undergo an ecological release, a pattern termed mesopredator release (Soulé et al. 1988; Crooks & Soulé 1999). In the San Diego habitat fragments, Crooks and Soulé (1999) found that lower visitation rates of coyotes in small, isolated remnants resulted in elevated numbers and activity of urban mesopredators, even after statistically controlling for potential confounding variables such as fragment area, age, and isolation. Mesopredator species therefore appear to be ecologically released by fragmentation not only because they can adapt well to urban environments, but also because such sites may provide refugia from dominant predators.

All Carnivores Are Not Created Equal

Although they are generally considered part of the same ecological guild, I found that carnivores were heterogeneous in their sensitivities to landscape and local fragmentation variables. As predicted, body-size differences partially accounted for this heterogeneity in response. Body mass was positively related to typical home-range sizes (Fig. 4b) and negatively related to typical population densities (Fig. 4c) recorded for these species, patterns consistent with those observed among mammals (Lindstedt et al. 1986). Due to their wide ranges and low densities, larger-bodied carnivores generally required larger areas (Fig. 4a), eventually disappearing in habitat fragments that were not connected by movement corridors. Obvious exceptions to the allometry of body size and fragmentation sensitivity, however, were spotted skunks, long-tailed weasels, and badgers, small- to medium-bodied species that exhibit relatively small home ranges and high population densities but that were detected only in the largest habitat blocks. Unlike the generalist urban mesopredators, these relatively specialized mustelids tend to be primarily carnivorous and somewhat restricted in their habitat preferences (Nowak 1999). Such specializations likely contribute to their patchy distribution in coastal southern California and increase their vulnerability to environmental disturbances. Clearly, in addition to body size, other ecological traits such as diet, resource specialization, social structure, and behavior contribute to species-specific responses to fragmentation effects.

Differential sensitivities to fragmentation can be useful criteria when focal species are chosen for ecological research and conservation planning. Mammalian carnivores can be excellent focal organisms with which to evaluate the degree of functional landscape-level connectivity, because they are area-dependent species that require movement corridors for persistence (Beier 1993; Noss et al. 1996; Soulé & Terborgh 1999). The choice of appropriate carnivore focal species, however, depends on the scale or intensity of fragmentation in an area and the corresponding responses of carnivore populations to fragmentation effects at that scale. As Figs. 1 and 2 make evident, the scale of landscape-level connectivity in southern California varies widely, ranging from small, isolated urban remnants to large, intact habitat blocks.

At one extreme of the connectivity scale are the highly fragmented landscapes of urban coastal southern California (e.g., patch size <1 km^2; Fig. 1a). Coyotes and urban mesopredators can be useful focal species with which to understand the effects of fragmentation at this scale. Fragmentation-enhanced predators such as opossums and domestic cats can function as direct, positive indicators of environmental disturbances associated with urban development, edge effects, and the invasion of exotic predators and competitors into natural systems. Coyotes have also persisted in developed areas in southern California. The remarkable behavioral plasticity of coyotes and their ability to succeed in disturbed areas limits their utility as an indicator of connectivity across much of coastal southern California. Nevertheless, coyote occupancy, residency, and relative abundance declined with fragment area and isolation, to the point of local extinctions of coyote populations in the smallest, most isolated urban remnants. Coyotes can therefore serve as useful indicators of functional connectivity in highly fragmented areas, particularly those sites that have already lost more vulnerable predators such as bobcats and mountain lions (Figs. 1 & 2). Furthermore, the ecologically pivotal role of coyotes (Crooks & Soulé 1999) warrants their inclusion in research and conservation plans, particularly in regions with active predator-control programs.

Mountain lions are situated at the opposite end of the connectivity scale (e.g., patch size >100 km^2; Fig. 1a) and appear extremely sensitive to the loss and fragmentation of habitat. The large body size and solitary behavior of mountain lions translate to large home ranges and low population densities (Table 4). Therefore, many of the isolated habitat remnants in urban southern California are likely too small and too isolated to permanently support any resident lion populations (Figs. 1 & 2) (see also Beier 1993). Consequently, mountain lions or other large, apex predators may not be the most effective indicator species with which to evaluate the degree of functional landscape-level connectivity in moderately to highly fragmented landscapes. The mountain lion's requirement for a large home range and its sensitivity to environmental perturbations, however, can make it a valuable focal species in larger, more intact habitat blocks (Beier 1993).

Finally, bobcats were intermediate in their sensitivity to fragmentation, a degree of sensitivity commensurate to the scale of fragmentation across much of coastal

southern California (e.g., 1 km^2 <patch size < 100 km^2; Fig. 1a). Bobcats were less sensitive to disturbance than mountain lions, which seldom occurred in fragmented areas, yet were more sensitive than coyotes and mesopredators, which were detected in even small urban habitat fragments. Bobcats are generally solitary and are strictly carnivorous (Nowak 1999), resulting in low densities and in resource specializations that likely increase their probability of local extinction. Landscape connectivity appears to be the key to the persistence of bobcat populations in developing landscapes. They can persist in fragmented habitats, but, as my results suggest, only in those landscapes with adequate movement linkages to larger natural areas. The status of bobcat populations is therefore a valuable indicator of the degree of functional, landscape-level connectivity across much of the fragmented landscapes of coastal southern California. In other systems, the choice of indicator species will require information on the level of fragmentation and connectivity in that region and how species respond to fragmentation effects at that scale.

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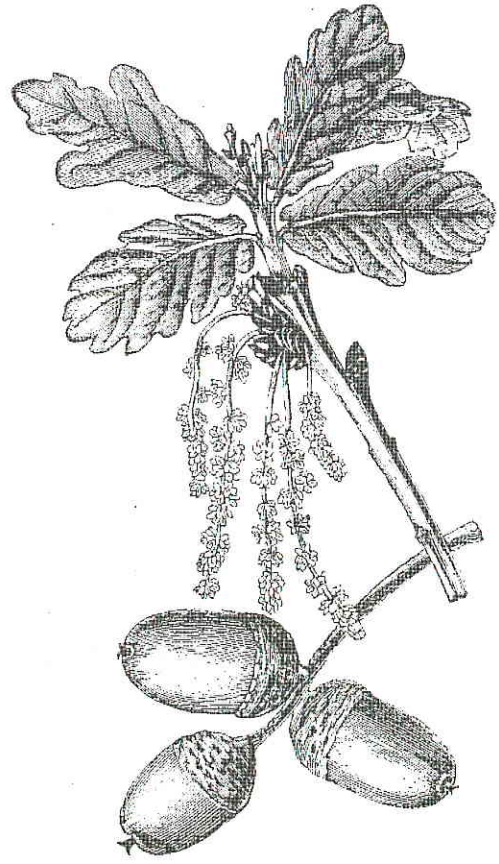

Mesopredator release and avifaunal extinctions in a fragmented system

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Mammalian carnivores are particularly vulnerable to extinction in fragmented landscapes[1], and their disappearance may lead to increased numbers of smaller carnivores that are principle predators of birds and other small vertebrates. Such 'mesopredator release'[2] has been implicated in the decline and extinction of prey species[2–6]. Because experimental manipulation of carnivores is logistically, financially and ethically problematic[6,7], however, few studies have evaluated how trophic cascades generated by the decline of dominant predators combine with other fragmentation effects to influence species diversity in terrestrial systems. Although the mesopredator release hypothesis has received only limited critical evaluation[8] and remains controversial[9], it has become the basis for conservation programmes justifying the protection of carnivores[6]. Here we describe a study that exploits spatial and temporal variation in the distribution and abundance of an apex predator, the coyote, in a landscape fragmented by development. It appears that the decline and disappearance of the coyote, in conjunction with the effects of habitat fragmentation, affect the distribution and abundance of smaller carnivores and the persistence of their avian prey.

In coastal southern California, intensive urbanization over the past century has destroyed most of the native sage-scrub habitat, leaving undeveloped steep-sided canyons as habitat islands in an urban sea. The mesopredator release hypothesis[2] was proposed as a possible mechanism to explain the rapid disappearance of scrub-breeding birds from this system. It predicted that the decline of the most common large predator (coyote) would result in the ecological release of native (striped skunk, raccoon, grey fox) and exotic (domestic cat, opossum) mesopredators, and that increased predation by these effective predators[2,10–12] would result in higher mortality and local extinction rates of scrub-breeding birds.

To test these predictions, we surveyed coyotes, mesopredators and scrub-breeding birds in 28 urban habitat fragments (see Methods). Coyote populations have declined or disappeared from some fragments; backward elimination multiple regression (BEMR) analyses (Table 1a) indicated that fragment size was a positive predictor of mean coyote abundance (averaged over quarterly sampling sessions). As predicted, the relationship between coyote and mesopredator abundance among fragments was consistently negative (Table 2). Total mesopredator abundance, summed over all mesopredator species, was higher in fragments with fewer coyotes; coyote abundance had the strongest negative relationship with grey fox, cat and opossum abundance (Table 2). BEMR analyses indicated that coyote abundance was the strongest predictor of total mesopredator, fox and opossum abundance after accounting for the potentially confounding effects of fragment area, age and isolation (Table 1b). The most important predictor of cat abundance was the inverse of fragment area, as would be expected because smaller fragments have proportionally more urban edge and therefore greater access by housecats bordering the fragment.

Simply the presence or absence of coyotes in a fragment also influenced mesopredator abundance. Mean total mesopredator abundance was more than twice as high in fragments that coyotes never visited during the course of the study (mean, 1.17; s.d., 0.299) than in fragments where coyotes were detected at least once (mean, 0.52; s.d., 0.436). Coyote presence had the strongest negative effect on domestic cat, opossum and raccoon abundance (Table 2). BEMR indicated that coyote presence or absence was an important predictor of total mesopredator, domestic cat, opossum and raccoon abundance after accounting for fragment area, age and isolation (Table 1c); the negative effect of fragment area was retained in the final regression models for total mesopredator, grey fox and domestic cat abundance.

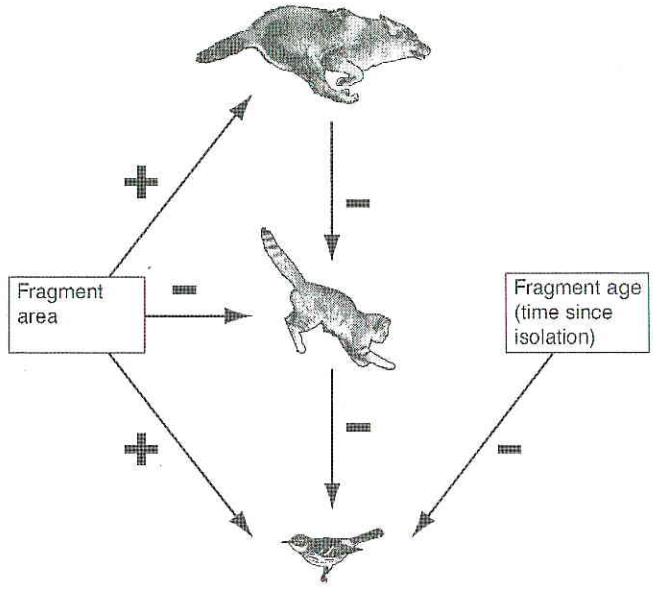

Figure 1 Model of the combined effects of trophic cascades and island biogeographical processes on top predators (for example, coyote), mesopredators (domestic cat) and prey (scrub-breeding birds) in a fragmented system. Direction of the interaction is indicated with a plus or minus.

In accordance with the mesopredator release hypothesis, the direction of the correlation between the number of native scrub-specialist bird species persisting in fragments (see Methods) and mesopredator abundance was consistently negative (Table 2). Bird species diversity decreased with total mesopredator abundance; bird diversity had the strongest inverse correlation with grey fox, domestic cat, opossum and raccoon abundance (Table 2). BEMR revealed that the positive effect of fragment area and the negative effect of fragment age were the strongest determinants of bird diversity in this system (Table 1d). However, the negative effects of total mesopredator, cat and raccoon abundance on bird diversity persisted even after accounting for age and area effects.

According to the mesopredator release hypothesis, the top predator should have an indirect and positive effect on bird species diversity[13]. As predicted, scrub bird diversity was higher in fragments where coyotes were either present or more abundant (Table 2). Both coyote presence or absence and coyote abundance remained significant predictors of bird diversity even after accounting for the strong effects of fragment area and age on bird populations (Table 1d).

Coyote abundance also varied across time in some fragments, permitting a more direct test of the causal mechanisms underlying the correlational patterns observed in the regression analyses; temporal variability was masked in the above analyses by using mean abundances averaged across quarterly sampling sessions in each fragment. In the 13 fragments that coyotes visited only temporarily during the study, mean abundance of total mesopredators in quarters without coyotes was higher than in quarters with coyotes (Wilcoxon matched pairs test: $Z = 3.110$, $P = 0.002$); this pattern of temporal avoidance was significant for foxes ($Z = 2.667$, $P = 0.008$), cats ($Z = 2.353$, $P = 0.019$) and skunks ($Z = 2.045$,

$P = 0.041$), and was not significant for opossums ($Z = 1.334$, $P = 0.182$) or raccoons ($Z = 1.007$, $P = 0.314$). Indeed, temporal variance in total mesopredator visitation rate was significantly higher in the 13 fragments in which coyotes came and went compared to the 15 fragments in which coyotes were either constantly present or absent ($t = 2.18$, $P = 0.038$). Finally, within each of the five fragments surveyed for two years, total mesopredator visitation rate increased when coyote visitations declined (Table 3); this temporal avoidance between coyote and mesopredators was largely driven by coyote–cat interactions.

Mesopredators not only temporally avoided coyotes within fragments, but also avoided sites in fragments where coyotes were most active. In the 11 fragments where mesopredators were detected and where coyotes were present in every quarterly sampling session, coyotes and mesopredators visited the same track station on the same night significantly less than expected based on random visitations of both taxa (contingency $X^2 = 12.39$, $P < 0.001$). This pattern was evident for foxes ($X^2 = 4.572$, $P = 0.032$ in 8 fragments with foxes) and opossums ($X^2 = 2.96$, $P = 0.086$ in 9 fragments), but was not significant for cats ($X^2 = 0.856$, $P = 0.355$ in 11 fragments), skunks ($X^2 = 1.74$, $P = 0.187$ in 7 fragments) or raccoons ($X^2 = 0.900$, $P = 0.343$ in 4 fragments).

The interactions between coyotes, cats and birds probably have the strongest impact on the decline and extinction of scrub-breeding birds. Coyotes kill domestic cats in these habitat fragments. Cat remains were found in most fragments with coyotes, and 21% of 219

Table 1 BEMR models of effects of trophic interactions and biogeographical variables

	Whole model			
	R^2	P	Parameter estimate	P
(a) Dependent variable: coyote abundance*				
Coyote abundance	0.111	0.046		
Area			0.381	0.046
(b) Dependent variables: mesopredator abundance†				
Total mesopredator abundance	0.314	0.002		
Coyote abundance			−0.560	0.002
Grey fox abundance	0.356	<0.001		
Coyote abundance			−0.596	<0.001
Domestic cat abundance	0.316	0.002		
Area			−0.562	0.002
Opossum abundance	0.373	<0.001		
Coyote abundance			−0.611	<0.001
Skunk abundance				
n.s.‡				
Raccoon abundance				
n.s.				
(c) Dependent variables: mesopredator abundance§				
Total mesopredator abundance	0.266	0.021		
Coyote presence/absence			−0.349	0.063
Area			−0.290	0.119
Grey fox abundance	0.083	0.137		
Area			−0.288	0.137
Domestic cat abundance	0.475	<0.001		
Coyote presence/absence			−0.418	0.011
Area			−0.438	0.008
Opossum abundance	0.285	0.003		
Coyote presence/absence			−0.533	0.003
Skunk abundance				
n.s.				
Raccoon abundance	0.122	0.068		
Coyote presence/absence			−0.350	0.068
(d) Dependent variable: bird diversity‖				
Bird diversity	0.886	<0.001		
Coyote presence/absence			0.464	<0.001
Area			0.511	<0.001
Age			−0.388	<0.001
Bird diversity	0.757	<0.001		
Coyote abundance			0.234	0.042
Area			0.558	<0.001
Age			−0.531	<0.001
Bird diversity	0.741	<0.001		
Total mesopredator abundance			−0.199	0.101
Area			0.569	<0.001
Age			−0.486	<0.001
Bird diversity	0.745	<0.001		
Domestic cat abundance			−0.235	0.082
Area			0.516	<0.001
Age			−0.480	<0.001
Bird diversity	0.762	<0.001		
Raccoon abundance			−0.241	0.031
Area			0.592	<0.001
Age			−0.478	<0.001
Bird diversity¶	0.739	<0.001		
Area			0.648	<0.001
Age			−0.558	<0.001

At successive steps in the backward elimination procedure, the least significant independent variable was removed from the model if the significance of the parameter estimate >0.1b (ref's 18, 19). This process was continued until no variables met this criteria. Tolerance values indicated that no set of independent variables violated multicollinearity assumptions[18]. The resulting final models are presented above, with the independent variables retained in the final model in italics. Path analyses conducted on these data yielded similar results as the multiple regression analyses.

* Independent variables: fragment area, fragment age and fragment isolation.

† Independent variables: coyote abundance, fragment area, fragment age and fragment isolation.

§ Independent variables: coyote presence/absence, fragment area, fragment age and fragment isolation.

‖ Independent variables: coyote presence/absence, coyote abundance or mesopredator abundance, and fragment area, age and isolation.

‡ No independent variables were retained in the final model.

¶ Skunk, fox and opossum abundance were not retained in final models that included area and age effects.

coyote scats collected in these sites contained cat remains. Moreover, 25% of radio-collared cats were killed by coyotes (K.C., manuscript in preparation). Perhaps the strongest effect of coyotes on cats, however, is indirect. Seventy-one per cent of 636 respondents to questionnaires distributed to residents bordering the fragments realized that coyotes were a threat to cats, 42% of all cat owners in areas with coyotes reported that coyotes had attacked or killed their cats and, most importantly, 46% of cat owners restricted their cat's outdoor activity when they believed coyotes were in the fragment.

Unlike wild predators, domestic cats are recreational hunters maintained far above carrying capacity by nutritional subsidies from their owners; they continue to kill prey species even when populations of that species are low[11]. Thirty-two per cent of residents bordering the San Diego fragments owned cats, and on average each cat owner owned 1.7 cats. Seventy-seven per cent of cat owners let their cats outdoors, and 84% of outdoor cats brought back kills to the residence. Thus, approximately 35 hunting, outdoor cats surround a moderately sized fragment (~20 ha) bordered by 100 residences. In comparison, each fragment may support only one or two pairs of native predators such as foxes or coyotes. Cat owners reported that each outdoor cat that hunted returned on average 24 rodents, 15 birds and 17 lizards to the residence each year. Using these data, we estimate that cats surrounding a moderately sized fragment (~100 residences) return about 840 rodents, 525 birds and 595 lizards to residences per year. These approximations are probably underestimates, assuming that cats do not bring back all prey that they kill[14]. Identification of 68 prey items returned by cats bordering the fragments indicated that 67% of 26 rodents, 95% of 21 birds and 100% of 11 lizards were native species.

This level of bird predation appears to be unsustainable. Existing population sizes of some birds do not exceed 10 individuals in small to moderately sized fragments[15], so even modest increases in predation pressure from mesopredators, in conjunction with other fragmentation effects, may quickly drive native prey species, especially rare ones, to extinction. Extinctions of scrub-breeding birds are frequent and rapid; at least 75 local extinctions may have occurred in these fragments over the past century[15].

Our results indicate that the disappearance of a dominant carnivore results in elevated numbers and activity of mesopredators that exert strong predation pressure on native prey species. This conclusion is strengthened by changes in mesopredator activity in accord with temporal changes in coyote presence within fragments, as well as direct evidence of coyote predation on mesopredators and mesopredator predation on birds. We conclude that these trophic interactions combine with fragmentation effects to help structure this ecological community (Fig. 1). □

Table 2 Trophic interactions

	Coyote abundance r†	Coyote presence/absence t‡	Bird diversity r§
Total mesopredator abundance	−0.569***	−2.463**	−0.539***
Fox abundance	−0.597***	−1.080	−0.361*
Domestic cat abundance	−0.375**	−3.344***	−0.635***
Opossum abundance	0.611***	−3.220***	−0.464**
Skunk abundance	−0.105	0.362	−0.112
Raccoon abundance	−0.264	−1.908*	−0.487***
Bird diversity	0.452**	5.580***	

† Pearson correlations between mean coyote abundance (averaged across quarterly sampling sessions) and mean abundance of mesopredator species (averaged across quarterly sampling sessions) or number of scrub-breeding bird species in each of the 28 habitat fragments.
‡ t-test of mean abundance of mesopredator species or bird species diversity as function of coyote presence or absence in each fragment.
§ Pearson correlations between number of scrub-breeding bird species per fragment and mean mesopredator abundance.
* $P < 0.10$, ** $P < 0.05$, *** $P < 0.01$.

Methods

Biogeographical variables. We used fragment area, age and isolation as island biogeographical descriptors of the 28 urban habitat fragments[2]. The total area of each fragment was taken from digitized images of scaled aerial photographs taken in 1995 (range: 2–102 ha). Fragment age was defined as the number of years since isolation of the fragment by urban development (range: 11–95 yr). Fragment isolation was measured as the distance to the closest fragment of equal or larger size (range: 40–2,865 m). Biogeographical variables were log-transformed for analyses.

Carnivore surveys. From September 1995 through to August 1997, we conducted carnivore surveys in 28 habitat fragments originally studied in ref. 2. Relative abundance for each species was determined by establishing track detection stations at 250-m intervals along transects in each fragment, and conducting track surveys for five consecutive days in the autumn, winter, spring and summer for one year. In five fragments where coyote presence varied during the first year of surveys, we extended surveys for a second year to monitor further the effects of variation in abundance within sites. The presence of each species was verified using scat and remotely triggered camera surveys. Abundance in each quarter was expressed as the total number of visits to track stations for each species divided by the total sampling effort[16,17]; track indices were log-transformed for analyses. For each species, we averaged track indices across quarterly sampling sessions to derive a mean abundance per fragment for the duration of the study. In addition to calculating abundance for each species individually, we summed the relative abundance of mesopredators in each fragment to derive one metric for the total abundance of all small carnivores.

Bird surveys. We determined the number of scrub bird species in each fragment by point count and transect surveys, conducted in each fragment at least three different times by at least two different teams of trained observers from April 4 to June 9 1997 between sunrise and 10:30. Eight-minute point counts were conducted at stations established in or near native habitat at ~250-m intervals along the long axis of each fragment. For transect surveys, we walked slowly along the entire fragment and recorded all species detected (mean time spent per transect survey in each fragment, 107 min). We then combined the species occurrences generated by both the point count and transect surveys to calculate the number of scrub bird species at each site. We considered only those species that specialize on chaparral and coastal sage scrub habitat and rarely breed in developed sites: California quail, wrentit, spotted towhee, Bewick's wren, California thrasher, greater roadrunner, cactus wren and California gnatcatcher. Bird diversity was square-root transformed for analyses.

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Table 3 Temporal avoidance of coyotes by mesopredators

Coyote abundance versus:	Total mesopredator abundance	Domestic cat abundance	Fox abundance	Skunk abundance	Opossum abundance	Raccoon abundance
Fragment	r†	r	r	r	r	r
Baja	−0.785**	−0.667*	−0.577**	−4.401	−0.502	−0.328
Laurel	−0.769**	−0.814**	−0.426	−0.694*	−0.521	0.338
Spruce	−0.740**	−0.846***	−0.559	−0.272	−0.582	−0.198
Washington	−0.679*	−0.709**	−0.639	−0.424	−0.122	−0.773**
Titus	−0.723*	−0.424	−0.695*	−0.253	−0.581	0.193

† Pearson correlations between quarterly mesopredator and coyote abundance within five habitat fragments surveyed over two years.
* $P < 0.10$, ** $P < 0.05$, *** $P < 0.01$.

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Linking a genetic defect to its cellular phenotype in a cardiac arrhythmia

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Advances in genetics and molecular biology have provided an extensive body of information on the structure and function of the elementary building blocks of living systems. Genetic defects in membrane ion channels can disrupt the delicate balance of dynamic interactions between the ion channels and the cellular environment, leading to altered cell function[1–3]. As ion-channel defects are typically studied in isolated expression systems, away from the cellular environment where they function physiologically, a connection between molecular findings and the physiology and pathophysiology of the cell is rarely established. Here we describe a single-channel-based Markovian modelling approach that bridges this gap. We achieve this by determining the cellular arrhythmogenic consequences of a mutation in the cardiac sodium channel that can lead to a clinical arrhythmogenic disorder (the long-QT syndrome) and sudden cardiac death.

Several distinct genetic mutations in the *SCN5A* gene give rise to a congenital form of the long-QT syndrome and have been mapped to the α-subunit of the cardiac sodium channel (LQT3)[4]. The most severe is the ΔKPQ mutation, a three-amino-acid deletion of Lys 1505, Pro 1506 and Gln 1507 in the highly conserved portion of the III–IV linker, which is responsible for fast inactivation[5]. Clinically, the ΔKPQ mutation is associated with substantial prolongation of the Q–T interval on the electrocardiogram, which may precede syncope and sudden cardiac death.

To evaluate the electrophysiological consequences of the ΔKPQ defect at the level of the cardiac action potential, we constructed Markov models of the wild-type and ΔKPQ mutant channels based on experimental data[5–7]. The models were then integrated into the Luo–Rudy theoretical model of the cardiac ventricular action potential[8–10].

The Markovian models for the wild-type and ΔKPQ sodium channel are shown in Fig. 1. The wild-type channel model (Fig. 1a) includes three closed states (C3, C2 and C1), a conducting open state (O), and fast and slow inactivation states (IF and IS, respectively). The mutant channel model (Fig. 1b) contains two possible modes of gating, a 'background (dispersed) mode' and a 'burst mode'. The background mode includes the above six states (Fig. 1b); it is similar to the wild-type model except for alterations in the voltage dependence of activation, inactivation and recovery from inactivation (Box 1). Most (>99%) of the mutant channels reside in the background mode states. The models were incorporated into the Luo–Rudy model (Fig. 1c) for action potential simulations.

Box 1 Simulation methods

The general approach to modelling the action potential is the same as that described for the Luo–Rudy model[8–10] except that the I_{Na} transmembrane current is reformulated from the single-channel kinetics. We use the general approach of refs 20 and 21. All kinetic parameters were normalized to 37 °C with a Q_{10} of 3 (ref. 19).

All the simulations were encoded in C/C++. Simulations were implemented (double precision) on a Sun Workstation Ultra 1. A time step of 0.005 ms was used during the stimulus and the action potential upstroke. At all other times, a 0.01 ms time step was used.

Transition rates

Wild-type channel (ms^{-1}):

C3 → C2 $\alpha 11 = 3.802/(0.1027 \times \exp(-v/17.0) + 0.20 \times \exp(v/150))$
C2 → C1 $\alpha 12 = (3.802/(0.1027 \times \exp(-v/15.0) + 0.23 \times \exp(-v/150)))$
C1 → O $\alpha 13 = 3.802/(0.1027 \times \exp(-v/12.0) + 0.250 \times \exp(-v/150))$
C2 → C3 $\beta 11 = 0.1917 \times \exp(-v/20.3)$
C1 → C2 $\beta 12 = 0.20 \times \exp(-(v-5)/20.3)$
O → C1 $\beta 13 = 0.22 \times \exp(-(v-10)/20.3)$
O → IF $\alpha 2 = (9.178 \times \exp(v/29.68))$
IF → O $\beta 2 = ((\alpha 13 \times \alpha 2 \times \alpha 3)/(\beta 13 \times \beta 3))$
IF → C1 $\alpha 3 = (3.7933^{-9} \times \exp(-v/5.2))$
C1 → IF $\beta 3 = (0.0084 + 0.00002 \times v)$
IF → IS $\alpha 4 = \alpha 2/100$
IS → IF $\beta 4 = \alpha 3$

ΔKPQ mutant channel* (ms^{-1}):

xC3 → xC2
$\alpha 11 = 1.25 \times (3.082/(0.1027 \times \exp(-v/17.0) + 0.20 \times \exp(-v/150)))$
xC2 → xC1
$\alpha 12 = 1.25 \times (3.082/(0.1027 \times \exp(-v/15.0) + 0.23 \times \exp(-v/150)))$
xC1 → xO
$\alpha 13 = 1.25 \times (3.082/(0.1027 \times \exp(-v/12.0) + 0.250 \times \exp(-v/150)))$
xC2 → xC3 $\beta 11 = 0.1917 \times \exp(-v/20.3)$
xC1 → xC2 $\beta 12 = 0.20 \times \exp(-(v-5)/20.3)$
xO → xC1 $\beta 13 = 0.22 \times \exp(-(v-10)/20.3)$
O → IF $\alpha 2 = (9.178 \times \exp(v/100))$
IF → O $\beta 2 = ((\alpha 13 \times \alpha 2 \times \alpha 3)/(\beta 13 \times \beta 3))$
IF → UC1 $\alpha 3 = 20 \times (3.7933^{-9} \times \exp(-v/5.2))$
UC1 → IF $\beta 3 = 2 \times (0.0084 + 0.00002 \times v)$
IF → IS $\alpha 4 = \alpha 2/100$
IS → IF $\beta 4 = \alpha 3$

*x represents U or L, as transition rates in the background or burst modes are the same.

Transition rates between modes are background to burst, $\mu 1 = 2 \times 10^{-6}$ ms^{-1}; burst to background, $\mu 2 = 1 \times 10^{-2}$ ms^{-1}.

Extinction and Colonization of Birds on Habitat Islands

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Abstract: *We used point-count and transect surveys to estimate the distribution and abundance of eight scrub-breeding bird species in 34 habitat fragments and the urban matrix in southern California. We then calculated local extinction and colonization rates by comparing our data with surveys conducted in 1987. We classified factors that influence extinction and colonization rates into two types: (1) extrinsic factors, which are characteristics of the habitat fragments such as area, age, and isolation and (2) intrinsic factors, which are characteristics of the species that inhabit fragments, such as body size and population density. Over the past decade, at least one species went locally extinct in over 50% of the fragments, and local extinctions were almost twice as common as colonizations. Fragment size and, to a lesser extent, fragment age were the most important extrinsic factors determining extinction and colonization. Density indices of scrub birds were the most important intrinsic factors determining extinction rates, predicting the number of sites occupied, the probability of local extinction, relative area requirements, and time to local extinction.*

Extinciones y Colonizaciones de Aves en Hábitats Insulares

Resumen: *Utilizamos conteos puntuales e inspecciones en transectos para estimar la distribución y abundancia de ocho especies de aves con reproducción en maleza, en 34 fragmentos de hábitat y en la matriz urbana del sur de California. Posteriormente calculamos las extinciones locales y las tasas de colonización comparando nuestros datos con inspecciones realizadas en 1987. Clasificamos factores que influencian las tasas de extinción y colonización en dos tipos: (1) factores extrínsecos, características de los fragmentos de hábitat (área, edad y aislamiento) y (2) factores intrínsecos, características de las especies que habitan los fragmentos (tamaño del cuerpo y densidad poblacional). Durante la última década, al menos una especie se extinguió localmente en casi el 50% de los fragmentos y las extinciones locales fueron casi dos veces más comunes que las colonizaciones. El tamaño del fragmento y en menor medida la edad del fragmento fueron los factores extrínsecos más importantes que determinaron las extinciones y las colonizaciones. Los índices de densidad de aves de maleza fueron los factores intrínsecos más importantes determinando las tasas de extinción, prediciendo el número de sitios ocupados, las probabilidades de extinción local, los requerimientos de área relativa y el tiempo para la extinción local.*

Introduction

Habitat fragmentation has been implicated widely as a primary threat to natural populations (Wilcove et al. 1998). Many empirical studies have tried to infer species sensitivities to fragmentation from a single snapshot of patch occupancy (Soulé et al. 1988; Bolger et al. 1991), often assuming that all species are present in each fragment at creation. Thus, the absence of a species from a patch is interpreted as evidence of extinction, and the presence of a species in a patch is viewed as persistence since isolation. This approach can overestimate extinction, however, because all species are not necessarily

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present in each fragment initially (Bolger et al. 1991). Further, a static approach does not estimate recolonization, so this important process is often ignored or assumed to be low. Indeed, estimating colonization rates may be as important as documenting extinctions in the evaluation of species-specific sensitivities to fragmentation. Surveys from multiple time points are required to gain a more complete understanding of extinction-colonization dynamics.

Although most research on the effects of habitat fragmentation on birds has focused on forest habitats, other habitats in North America are rapidly disappearing, and the bird populations they support may be particularly sensitive to fragmentation (Herkert 1994). Mediterranean scrub habitats are particularly threatened, and remnant scrub patches may experience avifaunal collapse more quickly than temperate forest fragments (Soulé et al. 1988). Intensive development in coastal southern California over the past century has destroyed all but 10% of the native coastal sage scrub habitat (Jensen et al. 1990), creating a "hotspot" of endangerment and extinction for the highly endemic biota in the region (Dobson et al. 1997).

Previous studies in this system have focused on how island biogeographic variables correlate with the presence or absence of eight species of chaparral and sage-scrub breeding birds in urban habitat fragments (Soulé et al. 1988; Bolger et al. 1991; Soulé et al. 1992). We revisited these fragments to estimate local extinctions and colonizations and to evaluate the factors that drive these processes. We expanded previous surveys by documenting not just the distribution of scrub birds among habitat fragments, but also estimating the density of populations within each fragment. Further, we also surveyed an urban development bordering a large natural area to investigate the degree to which the scrub species in our study are using the urban matrix within which the fragments are nested.

We classified factors that may influence local extinctions and colonizations as either extrinsic or intrinsic. Extrinsic factors are characteristics of the habitat fragments and the surrounding matrix. Soulé et al. (1988) found fragment size and age to be good extrinsic predictors of the distribution of scrub birds in the urban fragments. We therefore expected small fragments to have lost more species than large ones, and we expected fragments that had been recently isolated at the time of the first survey to have lost additional species over the past decade. In addition, the previous studies concluded that scrub bird dispersal was limited, with the habitat fragments functioning as isolated "islands" immersed in a matrix of inhospitable urban habitat (Soulé et al. 1988; Bolger et al. 1991). Therefore, we expected fragments that lacked birds 10 years ago to still lack these species, with few colonizations of previously unoccupied fragments. Overall, we expected the suite of scrub birds to show a net loss from this system due to further extinctions and limited colonizations.

We classified intrinsic factors as characteristics of the species that inhabit the fragments. Soulé et al. (1988) predicted that two intrinsic factors, abundance and body size, would be important determinants of the order of disappearance of scrub-breeding bird species in this system. First, species with naturally low population densities should be more vulnerable to extinction from a variety of deterministic and stochastic forces (Gilpin & Soulé 1986). Second, larger-bodied birds in insular populations might persist longer than small-bodied birds of equal abundance because larger animals live longer, have lower temporal variability in population size, and are better buffered against short-term environmental stochasticity (Pimm et al. 1988; Tracy & George 1992). We tested these predictions, evaluating how intrinsic factors interact with extrinsic factors to influence extinction and colonization rates.

Methods

Surveys

We surveyed 34 remnant fragments of chaparral and coastal sage scrub habitat in San Diego County, California, isolated at different times over the last century of urban development (for a map of the study area and exact location of the fragments, see Soulé et al. [1988] and Suarez et al. [1998]). Thirty of these fragments were the same as those used in prior studies of birds conducted in 1987 (Soulé et al. 1988; Bolger et al. 1991; Soulé et al. 1992); four recently isolated fragments were added to complement those in the original study (Suarez et al. 1998). Most of the sites are fragments of dendritic canyons dissecting coastal mesas, although a few also contain mesa-top habitat. These canyons, typically ranging from 15 to 60 m in depth, are completely surrounded by human-modified landscapes. The fragments support a mosaic of shrub habitat, including maritime succulent shrub, mixed chaparral, chamise chaparral, and coastal sage scrub, the dominant assemblage in most sites (Alberts et al. 1993).

We focused our surveys on eight scrub-specialist birds in the fragments; we defined a scrub bird as a species that requires coastal sage scrub and/or chaparral habitat for breeding (Soulé et al. 1988). These eight species, also surveyed by Soulé et al. (1988), were the California Quail (*Callipepla californica*), Greater Roadrunner (*Geococcyx californianus*), Cactus Wren (*Campylorhyncus brunneicapillus*), Bewick's Wren (*Thryomanes bewickii*), California Gnatcatcher (*Polioptila californica*), Wrentit (*Chamaea fasciata*), California Thrasher (*Toxostoma redivivum*), and Spotted Towhee (*Pipilo maculatus*).

Species occurrences in each fragment were assessed through transect and point-count surveys. For transect surveys, we walked slowly along the long axis of the entire fragment a minimum of three times and recorded all species detected (mean time spent per transect survey in each fragment = 107 minutes, SD = 82.34). In addition, three 8-minute point counts (following Bolger et al. 1997a) were conducted at stations established in native habitat at approximately 250-m intervals along the long axis of each fragment. The species lists generated from the point counts were combined with the species detected during transect surveys to generate species occurrences for each habitat fragment.

Transect and point-count surveys likely detected most, if not all, scrub species present in each fragment. The first visit to all 34 fragments yielded 76 detections of the eight scrub species (mean number of species detected per fragment during first visit = 2.23, SD = 1.69), the second visit resulted in only 14 new detections of the eight species across all fragments (mean per fragment = 0.41, SD = 0.66), and the third visit yielded only 5 new detections of the eight species across all fragments (mean per fragment = 0.14, SD = 0.36). In addition, multiple regression analyses indicated that the total time a fragment was surveyed was not significantly related to the number of species detected in a fragment ($\beta = 0.095$, $p = 0.640$) after fragment size was controlled ($\beta = 0.642$, $p = 0.003$).

We also used the point-count data to estimate a relative density index, averaged among fragments, for each scrub species. During point counts, we recorded all individuals detected, method of detection (e.g., call, song, visual, fly-over), distance to observer, and whether the bird was in the habitat fragment or the adjacent urban matrix. To estimate density indices for each species, we excluded all fly-overs, detections >100 m from the observer, and detections within the adjacent urban matrix. For each species, we calculated the average number of detections per 8-minute point count per station in each fragment. We then calculated a single density index for each species by averaging the density indices among fragments; to calculate this index we included only fragments in which the species was detected.

To complement fragment surveys and to evaluate the habitat suitability of the urban matrix, we established four parallel transects 250, 500, 750, and 1000 m from the boundary of a large area of continuous habitat, Mission Trails Regional Park, that supported the entire pool of scrub bird species. We conducted point counts at approximately 250-m intervals along each distance transect and calculated density indices for each species at each distance class.

Fragments and the urban matrix were surveyed at least three times by at least two different teams of observers. Surveys were conducted from 4 April to 9 June 1997 between sunrise and 1030 hours.

Local Extinction and Colonization

We defined a local extinction event operationally when a species detected in a given fragment in 1987 was not detected in 1997. We defined a colonization event operationally when a species absent in a given fragment in 1987 was detected in 1997. Because our estimates of extinction and colonization are based on two sample points, multiple extinctions and colonizations would be undetected. Further, our operational definitions of extinction and colonization assume that both studies detected all species actually present in each fragment and did not mistakenly list species that were not present (Hinsley et al. 1995). To ensure consistency between surveys, sampling methods and intensity were similar in both 1987 and 1997, and several researchers who collected data in 1987 also helped conduct surveys in 1997. In the case of the Greater Roadrunner, however, the 1987 surveys used questionnaires distributed to residents bordering fragments to augment field data (Soulé et al. 1988). Because questionnaire surveys likely increased estimated Greater Roadrunner occupancy in 1987 relative to 1997 field surveys, we excluded that species from all statistical analyses comparing 1997 data to 1987 results, including local extinction and colonization analyses.

The absolute number of local extinctions is dependent on the number of species originally present in the previous survey. For example, younger or larger fragments may have experienced more local extinctions because these fragments had more species to lose. To account for the number of species present in each fragment in the 1987 surveys, we calculated the proportion of local extinctions that had occurred since 1987: E/S, where E is the number of local extinctions in a given fragment and S is the number of scrub species detected in that fragment in 1987 (Diamond 1969; Hinsley et al. 1995). We omitted from the analyses fragments that had no scrub species in 1987 because these sites could experience no detectable extinctions.

Likewise, the number of colonizations is dependent on the number of species absent in the original survey. For example, younger or larger fragments may have experienced lower absolute colonization rates because they had more species and hence less opportunity for colonization. We therefore calculated the proportion of colonizations that had occurred since 1987: $R/(7 - S)$, where R is the number of colonizations in a given fragment and $(7 - S)$ is the number of the seven scrub species (excluding Greater Roadrunners) not detected in that fragment in 1987.

Extrinsic Factors

We used fragment area, age, and isolation (Table 1) to assess the effects of extrinsic factors on local extinction

and colonization rates in each fragment. We selected these three measures as the independent variables because they have been identified as important predictors of the occurrence of scrub birds (Soulé et al. 1988; Bolger et al. 1991) and other animals (Bolger et al. 1997*b*, Suarez et al. 1998; Bolger et al. 2000) in this system. Extrinsic variable data were log-transformed to meet normality assumptions in the statistical analyses. Total area of each habitat fragment was measured from digitized images of scaled aerial photographs taken in 1995. Fragment age, defined as the number of years since isolation of the habitat fragment by urban development, was obtained from San Diego County records (Soulé et al. 1988). Fragment isolation was measured as the distance to the closest fragment that was equal to or larger in size than the given fragment (Soulé et al. 1988). Of the three extrinsic factors, only fragment age and isolation were positively correlated ($r = 0.342$, $p = 0.048$).

In addition to the three extrinsic variables (area, age, isolation) we used in our statistical analyses, we also visually estimated percent native shrub cover remaining in fragments from aerial photographs and from ground surveys in each habitat fragment (Suarez et al. 1998). Percent shrub cover remaining in a fragment was highly negatively correlated with fragment age ($r = -0.719$, $p < 0.001$); native vegetative cover declined as time since isolation increased. To minimize multicollinearity between independent variables (Tabachnick & Fidell 1996), we included only fragment age in all statistical analyses. We therefore used age not only to measure a time effect in the fragments, but also to represent the cumulative loss of habitat since isolation.

Table 1. Extrinsic factors for the 34 habitat fragments surveyed for scrub-breeding birds in 1997.

Fragment	*Area (ha)*	*Age (yrs)*	*Isolation (m)*
32nd Street	10	65	304
34th Street	64	43	853
54th Street	4	29	609
60th Street	4	46	335
Acuna	7	31	110
Alta La Jolla	34	23	121
Baja	8	40	670
Bonita Long	44	8	682
Balboa Terrace	56	43	121
Canon	12	67	1219
Chateau	6	29	110
Chollas	6	45	1005
Del Mar	18	8	1023
El Mac	2	41	883
Florida	102	59	2100
Juan	7	32	228
Kate Sessions	31	25	121
Laurel	10	88	1554
Mil Cumbres	6	20	550
Montanosa	3	11	91
Oak Crest	6	15	400
Paseo Del Rey	8	20	91
Poinsettia	2	59	350
Pottery	10	23	45
Raffee	8	28	61
Sageview	13	19	227
Sandmark	72	29	914
Solana Drive	8	20	550
Spruce	4	95	1767
Syracuse	9	27	40
Talbot	2	64	1219
Titus	3	86	280
Washington	9	83	365
Zena	15	45	2865

We used logistic regression to evaluate the effects of fragment area, age, and isolation on the probability of occurrence for each species in 1997. The logistic regression models were parameterized with presence-absence data for each scrub species across all 34 fragments surveyed in 1997. For each species, we first entered size, age, and isolation as independent variables into the logistic model in a backwards sequential-elimination procedure (Knick & Rotenberry 1995; Tabachnick & Fidell 1996). At successive steps, the least significant independent variable was removed from the model. If deletion of the variable did not decrease the whole-model chi-square log-likelihood statistic ($p > 0.10$), then the variable was permanently removed from the model and the elimination procedure continued. If deletion of the variable decreased the model's fit to the data ($p \leq 0.10$), the variable was retained in the model. The significance of the final model was then tested by comparing the whole-model log-likelihood chi-square statistic against the log-likelihood statistic of an intercept-only model.

For species with significant area effects, we plotted logistic regression curves of the probability of occurrence of each species as a function of area, after holding fragment age and isolation constant by substituting their median values into the three-way logistic model. Likewise, for species with significant age or isolation effects, we constructed age or isolation curves after holding the other two independent variables constant. From these curves, we calculated the fragment area, age, and isolation at which the probability of occurrence of the species equaled 50% and used these estimates to represent the relative area requirements for each species (following Robbins et al. 1989; Vickery et al. 1994), the relative time to local extinction for each species, and the relative isolation thresholds for each species, respectively.

We also used multiple logistic regression models to evaluate graphically the combined effect of age and area on probability of occurrence for each species. Using these multiple logistic models, we estimated for each species the area requirement for a 95% probability of detection after 100 years of isolation. Relative area, isolation, and age thresholds from the logistic models, however, are not intended to represent the absolute fragment size, age, or isolation necessary to ensure the long-term persistence of populations (Hinsley et al. 1996). Rather, they

are intended to function only as relative indices of sensitivity to fragmentation.

Finally, we used sequential backward-elimination logistic regression analysis to determine how fragment size, age, and isolation predicted the probability of extinction and probability of colonization for each species since 1987. For each species, we included in the extinction models only those fragments occupied in 1987 and included in the colonization models only those fragments unoccupied in 1987. We conducted logistic regressions for extinction probability of the California Quail, Bewick's Wren, Wrentit, and California Thrasher. We omitted the Spotted Towhee because it had experienced no extinctions since 1987; the Greater Roadrunner was omitted for reasons described above, and the Cactus Wren and California Gnatcatcher were omitted because they occurred in only one (Bonita Long) and two (Sandmark, Bonita Long) fragments, respectively, in 1987. We conducted logistic regressions for colonization probability for those species that had experienced colonization over the last decade: Bewick's Wren, California Gnatcatcher, California Thrasher, and Spotted Towhee.

Intrinsic Factors

We used average body weight (Soulé et al. 1988) and average density indices as intrinsic factors characteristic of each species. We used multiple regression analyses to evaluate the effect of the density index and body size of each species on the relative area requirements, or the fragment area at which probability of occurrence equaled 50% from logistic models; the relative time to local extinction, or the fragment age at which probability of occurrence equaled 50% from logistic models; the number of fragments occupied (occupancy); the proportion of population extinctions; and the proportion of colonizations.

Results

Local Extinctions and Colonizations

Twenty-one local extinctions (30 extinctions including Greater Roadrunner) and 12 colonizations occurred across the 30 original habitat fragments resurveyed in 1997 (Table 2), yielding a 1.75 ratio of extinction to colonization. Local extinctions could occur only in previously occupied fragments, and colonizations could occur only in previously vacant fragments. In the 1987 surveys, the eight scrub birds exhibited 94 occurrences and 146 vacancies across the 30 fragments (Soulé et al. 1988). If an equal probability of extinction and colonization is assumed, the expected extinction:colonization ratio is 0.64, significantly lower than the observed 1.75 extinction:colonization ratio ($\chi^2 = 8.42$, $p = 0.004$).

The mean number of species lost per fragment was 1.00 ± 0.20 (range, 0–3), and the mean number of species gained per fragment was 0.40 ± 0.09 (range, 0–1). Five species exhibited more local extinctions than colonizations (in order of decreasing number of extinctions): California Quail, Greater Roadrunner, Wrentit, California Thrasher, and Cactus Wren (Cactus Wren, found in only one fragment in 1987, was not detected in any of these original fragments in 1997). Three scrub species exhibited more colonizations than local extinctions (in order of decreasing number of colonizations): Bewick's Wren, California Gnatcatcher, and Spotted Towhee. Colonizations of Bewick's Wren and local extinctions of California Quail contributed most to turnover rates (Table 2).

The proportion of local extinctions in a given habitat fragment was higher in smaller fragments ($r = -0.436$, $p = 0.033$) but was not significantly related to fragment age ($r = 0.070$, $p = 0.745$) or isolation ($r = -0.003$, $p = 0.988$). The relative number of colonizations increased with fragment size ($r = 0.382$, $p = 0.037$) but was not significantly related to fragment age ($r = -0.110$, $p = 0.562$) or isolation ($r = -0.118$, $p = 0.536$).

We recorded seven Bewick's Wren and two Spotted Towhee detections within the urban matrix bordering Mission Trails Regional Park (Table 3). Bewick's Wren was detected at each of the 250-, 500-, 750-, and 1000-m transects, and the Spotted Towhee was detected at the 250- and 750-m transects. No other scrub species were detected in developed areas.

Extrinsic Factors

PROBABILITY OF OCCURRENCE

Logistic regression models incorporating fragment area predicted the probability of occurrence of the California Quail, Greater Roadrunner, Bewick's Wren, California Gnatcatcher, Wrentit, California Thrasher, and Spotted Towhee (Table 4). Although the one fragment in which Cactus Wren was detected was relatively large (Bonita Long, 44 ha), logistic regression parameters and their significance could not be calculated for this species due to multicollinearity, ill-conditioning of the correlation matrix, and a resulting instability of estimates (Tabachnick & Fidell 1996). California Quail, Greater Roadrunners, and California Gnatcatchers were likely to occur in only the largest fragments (Fig. 1a). California Thrashers were often found in the largest patches, with probability of occurrence rapidly declining in patches smaller than about 10 ha. Bewick's Wrens, Wrentits, and Spotted Towhees were highly likely to occur in all but the smallest habitat patches. The estimated area at which probability of occurrence was 50% was 63 ha for the Greater Roadrunner, 48 for the California Gnatcatcher, 37 for the California Quail, 10 for the California Thrasher, 4 for the Spotted Towhee, 4 for the Wrentit, and 3 for the Bewick's Wren (calculated from Fig. 1a).

Table 2. Present distribution of eight scrub-specialist bird species in 30 southern Californian habitat fragments originally surveyed by Soulé et al. 1988.[a]

Fragment	*Wrentit*	*Bewick's Wren*	*Spotted Towhee*	*California Thrasher*	*California Quail*	*Roadrunner*	*California Gnatcatcher*	*Cactus Wren*	*Total extinctions*	*Total recolonizations*
Florida	1	1	1	1	1	0	1	0	0	0
Sandmark	1	1	1	1	1	1	1[b]	0	0	1
34th Street	1	1	1	1	0[c]	0[c]	0	0	2	0
Balboa Terrace	1	1	1	1	1	0	1[b]	0	0	1
Alta La Jolla	1	1	1	1	0[c]	0[c]	0	0	2	0
Kate Ses.	1	1	1	1	0[c]	0[c]	1[b]	0	2	1
Pottery	1	1[b]	1	0[c]	0[c]	0[c]	0	0	3	1
Laurel	0	1[b]	0	0	0	0	0	0	0	1
Canon	0	0	0	0	0	0	0	0	0	0
Zena	1	1	0	1[b]	0[c]	0	0	0	1	1
Baja	0[c]	1	1	0	0	0	0	0	1	0
Washington	0[c]	1[b]	0	0	0	0	0	0[c]	2	1
Solana Drive	1	1	1	1	0[c]	0[c]	0[c]	0	3	0
Syracuse	1	1	1	1	0[c]	0[c]	0	0	2	0
32nd Street South	1	1[b]	0	0	0	0	0	0	0	1
Mil Cumbres	1	1	1	0[c]	1	0[c]	0	0	2	0
Chollas	1	1[b]	0	0	0	0	0	0	0	1
60th Street	0[c]	1	0	0	0	0	0	0	1	0
Juan	0[c]	1	0	0	0	0	0	0	1	0
Acuna	1	1	1	0	0	0	0	0	0	0
Raffee	1	1	1	0	0	0	0	0	0	0
Spruce	0	1[b]	0	0	0	0	0	0	0	1
Oak Crest	1	1	1	0[c]	0[c]	0[c]	0	0	3	0
54th Street	1	0[c]	0	0	0	0	0	0	1	0
Titus	0[c]	1	0	0	0	0	0	0	1	0
Chateau	1	1	1	0	0	0	0	0	0	0
Talbot	0	0	0	0	0	0	0	0	0	0
Montanosa	1	1	1[b]	0[c]	0[c]	0[c]	0	0	3	1
Poinsettia	0	0	0	0	0	0	0	0	0	0
El Mac	0	0	1[b]	0	0	0	0	0	0	1
Extinctions	5	1	0	4	9	9	1	1	30	
Recolonizations	0	6	2	1	0	0	3	0		12

[a] *Fragments are listed in decreasing order of fragment size.*
[b] *Recolonizations from 1987 surveys.*
[c] *Extinctions from 1987 surveys.*

Fragment age predicted the probability of occurrence of California Quail, Cactus Wren, Wrentit, California Thrasher, and Spotted Towhee (Table 4). Probability of occurrence for the Cactus Wren was high in only the youngest fragments (Fig. 1b); the one fragment in which this species was detected was recently isolated (Bonita Long, 8 years). Probability of occurrence of the California Quail and California Thrasher was high in younger fragments but declined rapidly in fragments older than about 10 years. Probability of occurrence of the Wrentit and Spotted Towhee was high in all but the oldest fragments. The estimated age at which probability of occurrence was 50% was 4 years for the Cactus Wren, 13 for the California Quail, 21 for the California Thrasher, 41 for the Spotted Towhee, and 48 for the Wrentit (calculated from Fig. 1b).

After we controlled for area and age effects, isolation was a significant predictor of the probability of occurrence only for Bewick's Wren, which was more likely to be found in less isolated fragments (Fig. 1c). The degree of isolation at which probability of occurrence was 50% was 3.5 km (calculated from Fig. 1c).

Multiple logistic regression models of the combined effect of area and age generated "extinction surfaces," which consisted of plateaus of occupancy at larger and more recently isolated fragments that declined to basins of local extinctions at smaller and older fragments (Fig. 2). The effect of the interaction between age and area, and hence the contour of the extinction surfaces, varied among species. The estimated fragment size at which probability of occurrence was 95% after 100 years of isolation was 344 ha for Cactus Wrens, 173 for California Quail, 157 for Greater Roadrunners, 146 for Spotted Towhees, 118 for Gnatcatchers, 29 for Wrentits, 29 for California Thrashers, and 13 for Bewick's Wrens (calculated from Fig. 2).

LOCAL EXTINCTION AND COLONIZATION

Backward-elimination logistic regression indicated that models that accounted for fragment area significantly pre-

Table 3. Density indices, occupancy, body weight, proportion of extinctions, and proportion of recolonizations for scrub-specialist bird species in southern California.

	Average density index[a]									
Species	urban 250 m[b]	urban 500 m	urban 750 m	urban 1000 m	all urban[c]	fragments[d]	No. of fragments[e]	Body weight (g)	Proportion of extinctions[f]	Proportion of recolonizations[g]
Wrentit	0.00	0.00	0.00	0.00	0.00	0.97	23	14	0.22	0.00
Spotted Towhee	0.03	0.00	0.03	0.00	0.02	0.80	21	37	0.00	0.13
Bewick's Wren	0.03	0.07	0.10	0.03	0.06	0.76	29	9	0.05	0.60
California Thrasher	0.00	0.00	0.00	0.00	0.00	0.54	12	94	0.33	0.56
California Quail	0.00	0.00	0.00	0.00	0.00	0.49	7	184	0.69	0.00
California Gnatcatcher	0.00	0.00	0.00	0.00	0.00	0.22	5	8	0.50	0.11
Cactus Wren	0.00	0.00	0.00	0.00	0.00	0.13	1	40	1.00	0.00
Greater Roadrunner	0.00	0.00	0.00	0.00	0.00	0.04	1	304	0.90	0.00

[a]*Average number of detections per point-count survey within 100 m of point-count station.*
[b]*Density index per station along urban transect 250 m from the boundary of Mission Trails Regional Park.*
[c]*Density index per station among all urban stations.*
[d]*Density index per station per fragment detected.*
[e]*Number of fragments occupied by each species among the 34 fragments surveyed in 1997.*
[f]*Number of extinctions experienced by each species, accounting for number of fragments occupied in 1987.*
[g]*Number of colonizations experienced by each species, accounting for number of fragments not occupied in 1987.*

dicted the probability of local extinction for the California Quail, Wrentit, and California Thrasher (Table 4). Local extinctions of these species were more likely in smaller fragments (Table 2). Fragment age predicted extinction probability for Wrentits; higher extinction probabilities were found in older fragments. Isolation did not significantly predict extinction probability for any species.

Backward-elimination logistic regression indicated that models that accounted for fragment area significantly predicted the probability of colonization for Bewick's Wrens, California Gnatcatchers, California Thrashers, and Spotted Towhees (Table 4). Colonization of Bewick's Wrens, California Gnatcatchers, and California Thrashers was more likely in larger fragments, whereas the two colonizations for Spotted Towhees occurred in smaller and younger fragments (Table 2). A model incorporating fragment isolation significantly predicted the probability of colonization for California Thrashers; paradoxically, the association was negative, with the one colonization for this species occurring in a highly isolated fragment.

Intrinsic Factors

Bewick's Wrens, Wrentits, and Spotted Towhees were frequently detected, California Quail and California Thrashers were less abundant, and Greater Roadrunners, Cactus Wrens, and California Gnatcatchers were detected only rarely (Table 3). The negative correlation between body size and average density index was not significant ($r = -0.521$, $p = 0.186$). After we accounted for differences in body size, multiple regressions revealed a significant effect of average density index on occupancy ($\beta = 8.70$, $p = 0.008$), proportion of local extinctions ($\beta = -0.791$, $p = 0.035$), relative-area requirements ($\beta = -0.844$, $p = 0.019$), and relative time to local extinction ($\beta = 0.901$, $p = 0.003$). Relative-area requirements and proportion of local extinctions were inversely related to the average density index, whereas time to local extinction and occupancy increased with the average density index (Fig. 3).

In contrast, after we accounted for abundance effects, multiple regressions revealed that body size was not related to occupancy ($\beta = -0.095$, $p = 0.657$), proportion of local extinctions ($\beta = 0.255$, $p = 0.369$), or relative-area requirements ($\beta = 0.141$, $p = 0.556$). Body size, however, was negatively related to relative time to local extinction ($\beta = -0.231$, $p = 0.041$); larger animals disappeared from fragments more rapidly than smaller species after we accounted for differences in abundance. Neither average density index ($\beta = 0.236$, $p = 0.627$) nor body size ($\beta = -0.361$, $p = 0.467$) was related to proportion of colonizations.

Discussion

Local extinctions of one or more scrub bird species occurred in 16 out of 30 (53%) habitat fragments, and local extinctions were almost two times more frequent than colonizations. The Greater Roadrunner and California Gnatcatcher have already been extirpated from most urban fragments, today occurring in only the largest sites. The Cactus Wren disappeared from the one fragment in which it occurred in 1987 and was detected in only one additional site in the current surveys, a relatively large (44 ha) and young (8 years) fragment. The Cactus Wren, however, specializes on patchily distributed maritime succulent scrub habitat (Unitt 1984) and may not have been present in many of these sites at the time of isolation from urban development. The California Quail, Wrentit, and California Thrasher exhibited 18 local extinctions since 1987 and only one colonization; local extinctions were more common in fragments that were small (<10 ha) and,

Table 4. **Results of backward-elimination logistic regression models of the effect of fragment size, age, and isolation on the probability of occurrence, probability of extinction, and probability of recolonization of scrub-breeding birds in San Diego habitat fragments.**

	Whole-model log-likelihood χ^2	p[a]	*Parameter estimate*	χ^2 *to remove*[b]	p
Occurence					
Bewick's Wren	13.29	0.001			
intercept			5.70		
area			6.46	10.56	0.001
isolation			−3.23	3.55	0.060
Cactus Wren[c]	6.25	0.012			
intercept					
age					
California Gnatcatcher	19.13	<0.001			
intercept			−12.09		
area			7.60		
California Quail	16.71	<0.001			
intercept			2.07		
area			4.42	11.97	<0.001
age			−6.03	5.41	0.020
California Thrasher	34.89	<0.001			
intercept			−7.25		
area			22.97	30.70	<0.001
age			−10.64	5.59	0.018
Greater Roadrunner	3.98	0.046			
intercept			−13.95		
area			6.78		
Spotted Towhee	29.37	<0.001			
intercept			18.73		
area			3.53	6.70	0.010
age			−13.73	22.07	<0.001
Wrentit	28.48	<0.001			
intercept			14.04		
area			6.15	9.26	0.002
age			−11.67	18.05	<0.001
Extinction					
Bewick's Wren[d]	n.s.[e]				
California Quail	3.10	0.078			
intercept			4.22		
area			−2.49		
California Thrasher	10.70	0.001			
intercept			12.00		
area			−13.26		
Wrentit	11.84	0.003			
intercept			10.63		
area			−5.97	5.27	0.022
age			9.27	8.31	0.004
Recolonization					
Bewick's Wren	4.21	0.040			
intercept			−3.24		
area			5.11		
California Gnatcatcher	11.56	<0.001			
intercept			−10.74		
area			6.54		
California Thrasher[c]	7.72	0.021			
intercept					
area					
isolation					
Spotted Towhee[c]	9.03	0.011			
intercept					
area					
age					

[a] *Significance of final model was tested by comparing the whole-model log-likelihood* χ^2 *statistic against the log-likelihood statistic of an intercept-only model. For final models with only one independent variable, this test therefore also evaluated the significance of the removal of that variable from the model.*

[b] *Difference in whole-model* χ^2 *with and without independent variable in model. Calculated only for models with two or more independent variables.*

[c] *Parameters and their significance could not be calculated reliably due to ill-conditioning of correlation matrix and resulting instability of estimates.*

[d] *No independent variables were retained in the model.*

[e] *Not significant.*

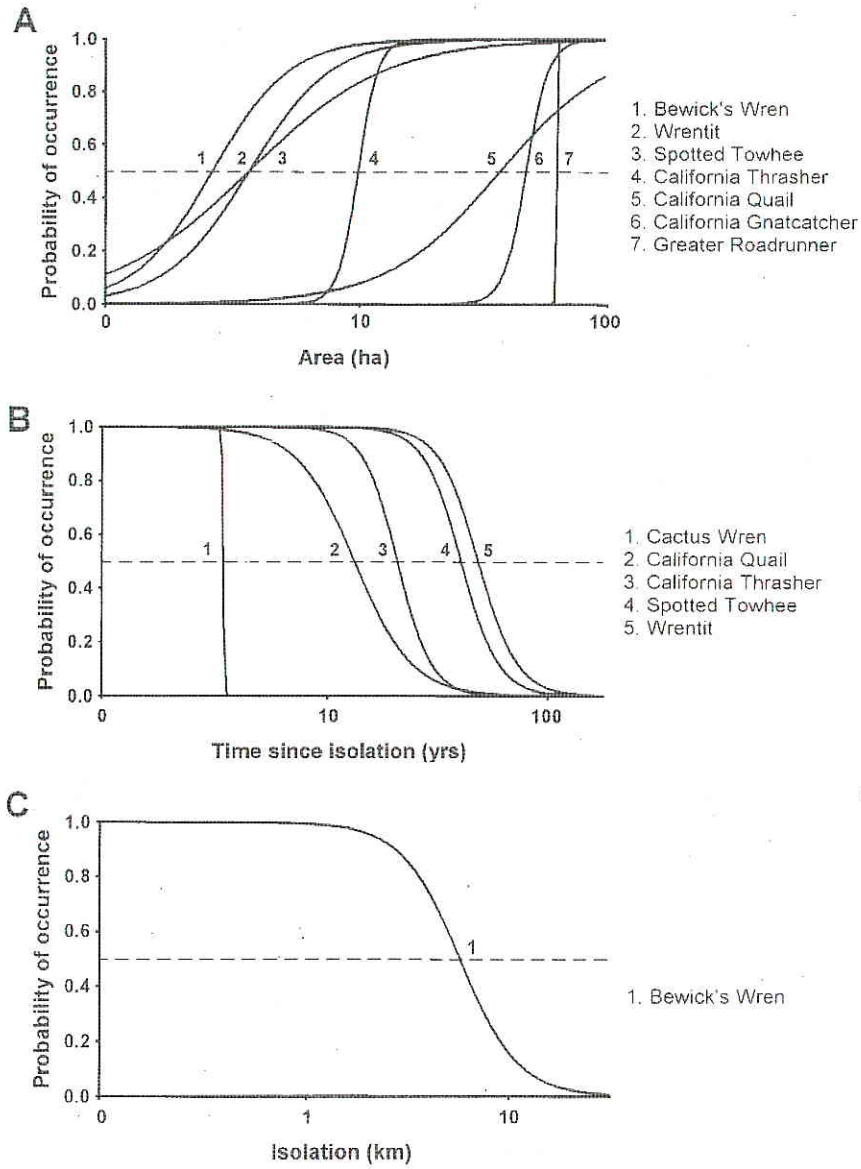

Figure 1. Logistic regression models of the probability of occurrence of eight scrub-breeding bird species as a function of fragment (a) area, (b) age, and (c) isolation. Area, age, and isolation curves were constructed after the other two independent variables were held constant by substituting their median values into a three-way logistic regression model. Only species with significant area, age, or isolation effects in the multiple logistic regression models are presented. Dashed line represents 50% probability of occurrence.

for the Wrentit, fragments that were relatively old (32–86 years). Colonizations, although relatively infrequent, occurred more often than local extinctions for Bewick's Wren, California Gnatcatcher, and Spotted Towhee. Thus, species-occurrence patterns in habitat remnants appear to result from extinction and colonization dynamics, modified by a combination of extrinsic and intrinsic factors.

Extrinsic Factors

The size of the fragment was the most important extrinsic factor determining occupancy patterns, local extinctions, and colonizations of scrub species, confirming the prediction of Soulé et al. (1988). Most scrub species were more likely to go extinct and less likely to colonize small fragments over the last decade and were more likely to occur in larger fragments during this study. Likewise, smaller fragments experienced higher local extinction rates and lower colonization rates over the last decade. Higher relative extinction rates in small fragments are likely explained in part by the fact that these fragments supported fewer scrub species in 1987. Thus, any extinctions would result in higher proportional extinction rates. Nevertheless, the high rate of local extinc-

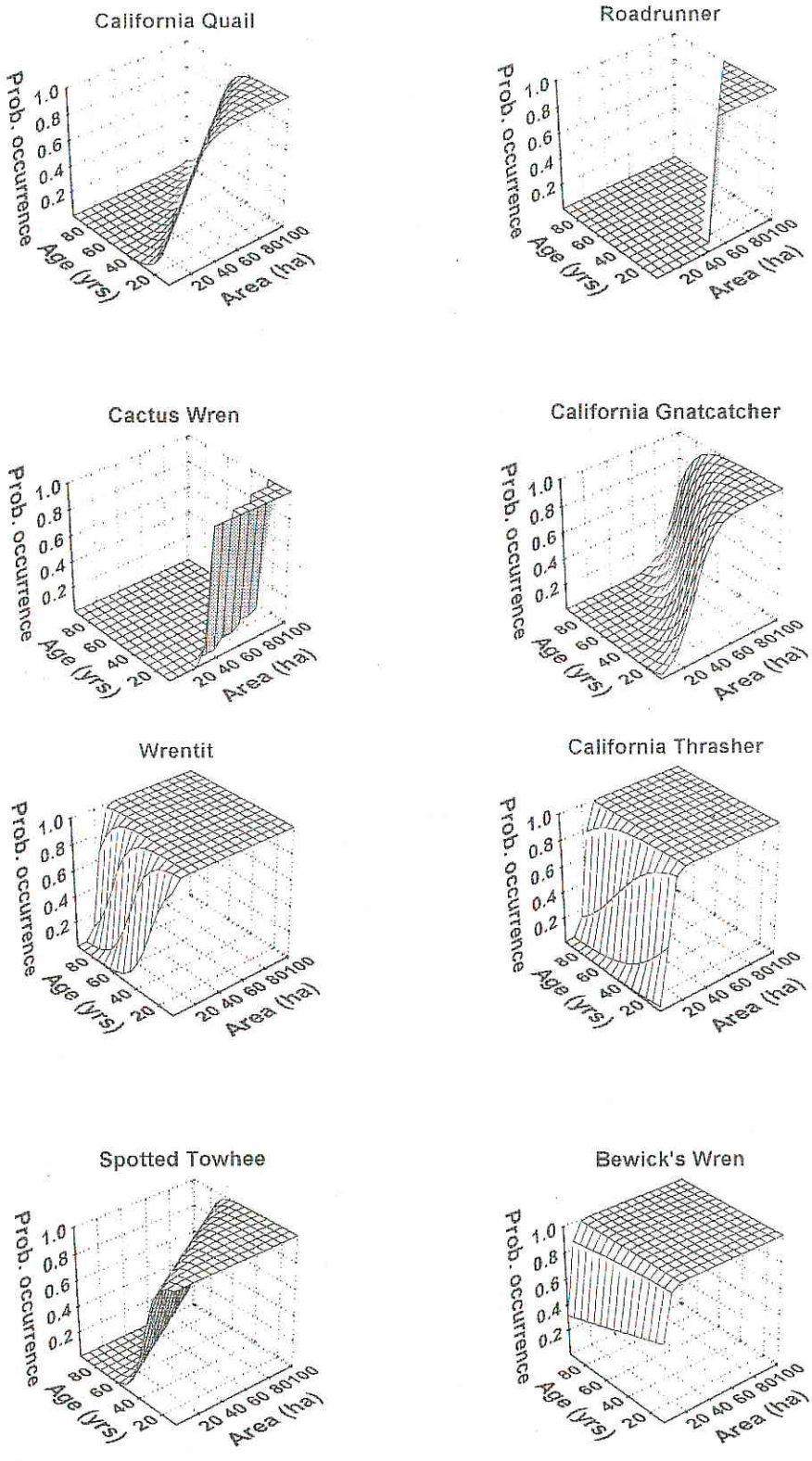

Figure 2. Multiple logistic regression models of the probability of occurrence of eight scrub-breeding bird species as a function of fragment area and age. Local extinction surfaces are parameterized with occupancy data from the 1997 surveys.

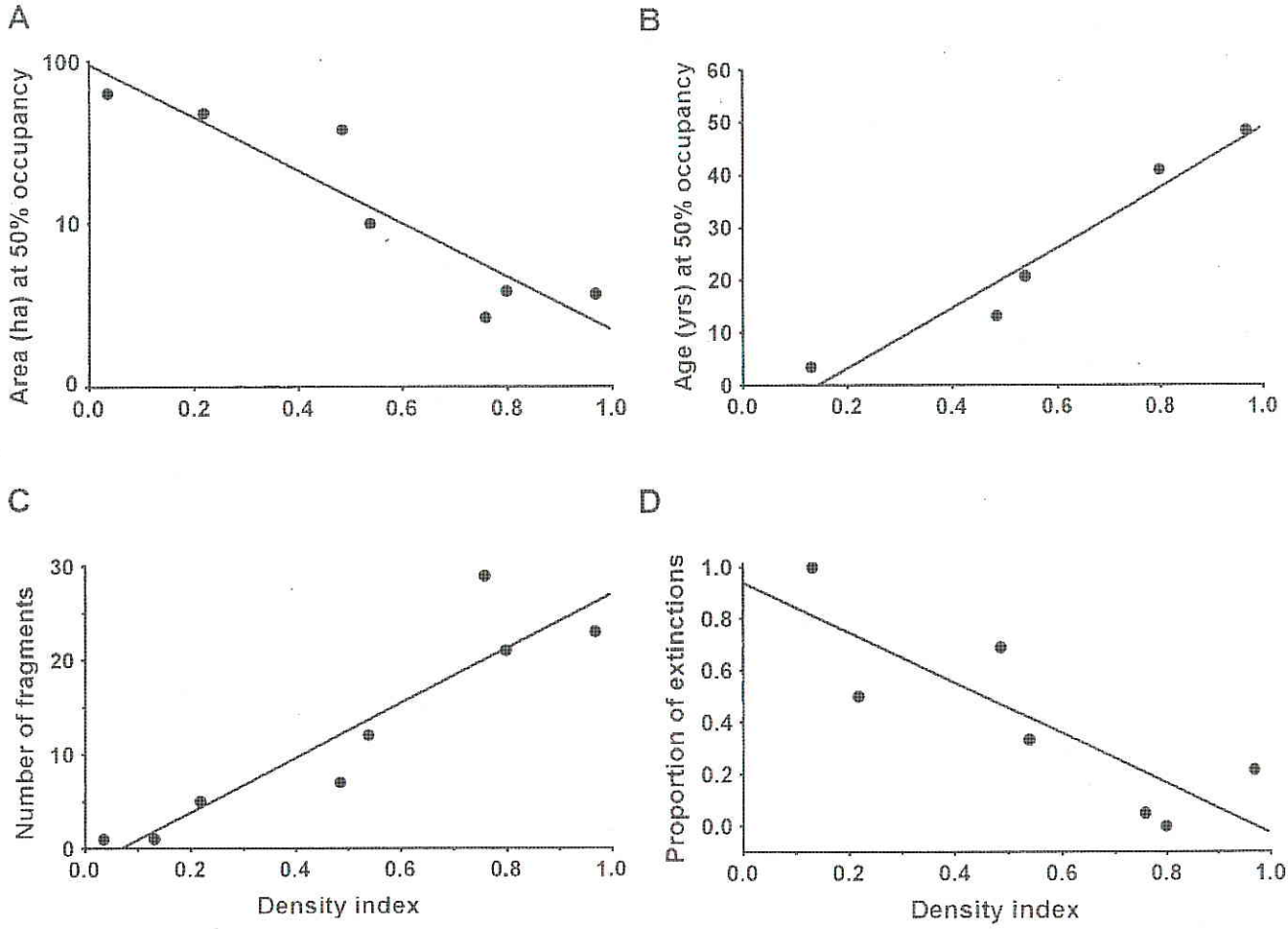

Figure 3. Relationship between density indices of each scrub bird species and (a) relative-area requirements, or the fragment area at which the logistic model predicted a 50% probability of occupancy for the seven species with significant area logistic regressions; (b) relative time to local extinction, or the fragment age at which the logistic model predicted a 50% probability of occupancy for the five species with significant age logistic regressions; (c) number of fragments occupied; and (d) proportion of local extinctions (accounting for the number of fragments occupied in 1987).

tions emphasizes the instability of bird populations in small, isolated, and old fragments (Hinsley et al. 1995).

As predicted by Soulé et al. (1988), fragment age was also an important extrinsic factor determining occupancy and extinction probabilities. The effect of age, however, appeared to be less than that of area: the proportion of local extinctions in each fragment varied with fragment area but not with age. Fragment age, however, was an important determinant of probability of occurrence for some scrub species: most scrub species were more likely to occur in recently isolated fragments. In the earlier surveys, older fragments had already lost many scrub birds, whereas the youngest habitat fragments, even the smallest ones, still contained most scrub species. This study revealed extinctions in these younger fragments since 1987. For example, four of the youngest fragments (Mil Cumbres, Montanosa, Oak Crest, and Solana) each supported most scrub species in 1987, and these young fragments accounted for 11 of the 30 (37%) recorded local extinctions over the previous 10 years.

Unlike area and age, isolation of a fragment did not significantly predict probability of occurrence or number of local extinctions for most scrub bird species. A weak effect of fragment isolation may be caused in part by the low vagility of scrub-breeding birds. Dispersal has not been studied explicitly in these birds, but they are generally considered to be restricted to coastal sage scrub and chaparral habitat, usually feeding on the ground or within shrub cover, flying low through the scrub canopy, and rarely flying far (Unitt 1984; Soulé et al. 1988). Indeed, the California Quail, Greater Roadrunner, Cactus Wren, Wrentit, and California Thrasher were not detected in urban counts, and all of these species except the California Thrasher (which colonized only one fragment) were not detected in fragments in which they were previously absent. These results are therefore con-

sistent with restricted dispersal for some scrub bird species. If developed areas do not represent suitable habitat, the habitat fragments may emulate true islands for these species. In other insular systems, it has been suggested that the documented disappearance of birds might not represent actual "extinctions" of isolated populations on islands, but rather movement of individuals among islands within large regional populations (Haila & Hanski 1993; Simberloff 1994). In this system, however, movement between fragments appears to have been limited, so in most cases the disappearances we recorded are likely are actual population extinctions. Local extinctions in excess of colonizations suggest that these particular species are still disappearing.

Although it appears that dispersal is limited and extinctions ongoing for most scrub bird species, we did record 12 colonizations. Three species—Bewick's Wren California Gnatcatcher, and Spotted Towhee—had experienced more colonizations than local extinctions since 1987 (although they were still absent from a number of fragments that seemed capable of supporting them). Bewick's Wrens and Spotted Towhees were also detected within the urban matrix. In particular Bewick's Wren appears to be the scrub species most capable of dispersal and colonization across the urban matrix. We recorded six apparent colonizations of Bewick's Wren, and it was the most frequent scrub bird in the urban counts. Furthermore, Bewick's Wren, the only scrub species to show a significant relationship with fragment isolation, was more likely to occur in less isolated fragments, consistent with an ability to occasionally recolonize nearby fragments across the urban matrix. Our estimates of the permeability of the urban matrix also may be underestimates; our urban counts were conducted during the spring and thus reflect use of the urban matrix as breeding habitat, but dispersal might occur in late summer and fall when young are leaving natal areas (Thaxton & Hingtgen 1996).

Thus, Bewick's Wrens, and perhaps the California Gnatcatchers and Spotted Towhees, appear to exist in discrete subpopulations connected by occasional colonization. For these species, a metapopulation perspective (Levins 1969), in which the overall persistence of a species across the landscape is a function of recolonizations of populations from nearby patches, may be an appropriate model (Akçakaya & Atwood 1997). A metapopulation approach predicts that the entire network of habitat fragments, including fragments currently unoccupied, may be critical to the long-term persistence of these species (Hanski 1998).

Intrinsic Factors

In accordance with Soulé et al.'s (1988) prediction, we found that for scrub species the average density index was significantly related to the number of sites occupied, to relative-area requirements, to relative time to local extinction, and to local extinction rates. Extinction on islands is thought to result frequently from the effects of environmental, demographic, and genetic stochasticity in small, isolated populations (Gilpin & Soulé 1986). Because both population density and fragment area were highly significant and independent predictors of local extinction rates for scrub species, population size appears to be a factor driving extinction rates for scrub species.

Body mass incorporates physiological, life-history, and ecological characteristics of species (Peters 1983). The relationship between body size and extinction risk in birds, however, has been the subject of considerable debate, and evidence of a generalized pattern remains equivocal (Terborgh 1974; Pimm et al. 1988; Tracy & George 1992; Gaston & Blackburn 1995; Johst & Brandl 1997). In our study, body size did not significantly predict occupancy and number of local extinctions in scrub species. Body size, however, was correlated with time to local extinction: extinction was more rapid for larger species, even after we accounted for abundance differences in birds of different sizes. Indeed, all but one of the extirpations in the four youngest canyons were of California Quail, Greater Roadrunners, and California Thrashers, the three largest birds; over all the fragments, we recorded 23 local extinctions but only one colonization of these three species. Thus, although large-bodied animals may live longer, have lower population variation, and be better buffered against short-term environmental stress (Pimm et al. 1988; Tracy & George 1992), larger species in this system also may be less vagile and may have higher resource requirements, thereby limiting colonization and increasing extinction probabilities (Terborgh 1974).

The probability of extinction for any species depends on complex interactions of species characteristics and environmental variables that affect both individuals and populations (Tracy & George 1992). Although density appears to be a good predictor of extinction vulnerability of scrub birds, other ecological differences will clearly affect their persistence. All species in this study breed in scrub habitats in this region, but they vary greatly in ecological traits such as trophic level, fecundity, longevity, territory size, and food and nesting requirements. For example, Roadrunners, a top predator on vertebrates, occupy relatively large territories (approximately 40–50 ha per breeding pair; Hughes 1996) and therefore would be able to persist in only the largest fragments. Given the ecological heterogeneity of these birds, idiosyncratic autecological features of individual species must be considered in the design of conservation measures for these species in fragmented landscapes.

Possible Mechanisms

The loss and degradation of habitat certainly contributes to extinctions within fragments. Native vegetative cover

declines closer to the urban edge (Suarez et al. 1998), fragments with proportionally more urban edge have an increased diversity of ruderal and ornamental plant species (Alberts et al. 1993), and the proportion of native shrub cover declines with fragment age (Soulé et al. 1988; Suarez et al. 1998). Changes in microhabitat availability within fragments may particularly affect species with strict habitat requirements, such as the Cactus Wren, which specializes on maritime succulent scrub (Unitt 1984), and the California Gnatcatcher, which requires coastal sage scrub (Akçakaya & Atwood 1997). Local extinctions can also occur before there is much loss of habitat, however. We recorded disappearances of scrub birds in young fragments that were isolated only recently, and we recorded nine local extinctions in fragments that still retained a high proportion (>75%) of native shrub cover.

In addition to overt habitat degradation or other physical changes in the fragments, other factors likely contribute to extirpations of scrub birds. For example, the matrix surrounding habitat islands may support competitors and predators whose interactions with species within islands may alter population persistence and community structure (Wilcove 1985; Andren & Angelstram 1988). Exotic carnivores (opossums, domestic cats) and native carnivores (gray foxes, striped skunks, and raccoons) occur within the developed matrix and are predators on birds and bird nests in this system (Soulé et al. 1988; Langen et al. 1991; Crooks & Soulé 1999) and elsewhere (Wilcove 1985; Churcher & Lawton 1987; Leimgruber et al. 1994). Numbers and activities of these opportunistic "mesopredators" increase with the disappearance of the dominant predator, the coyote, in the fragments, a process termed *mesopredator release* (Soulé et al. 1988; Crooks & Soulé 1999). In turn, the species richness of scrub-breeding birds was lower in fragments with more mesopredators and fewer coyotes, even after we accounted for the positive effect of fragment area and the negative effect of fragment age on scrub bird persistence (Crooks & Soulé 1999).

Conclusions

Urban habitat fragments in coastal southern California continue to show a net loss of scrub bird species. A few species, however, particularly Bewick's Wren, seem capable of recolonizing fragments across the urban matrix. Logistic regression models predict that most species have low probabilities of persisting in the smallest fragments over time. The logistic models for several species, such as Bewick's Wren, Wrentit, and California Thrasher, predict high probabilities of occurrence in old fragments, but only if they are large. Other species, such as the California Quail, Greater Roadrunner, Cactus Wren, and California Gnatcatcher, have little chance of long-term persistence in even the largest of these fragments. No fragments were large enough to support the full complement of scrub-breeding bird species with 95% probability over the next 100 years.

Although these projections do not evoke optimism, native species can still persist within the fragments. Because of their habitat specializations and limited dispersal abilities, the scrub-breeding birds we surveyed are the most sensitive birds in this system to the loss and fragmentation of habitat. Despite this vulnerability, some of their populations have persisted for up to a century in a rapidly developing landscape and might continue to persist, particularly in the largest fragments. The urban habitat fragments also support many other native bird species, such as those that are less specialized and better dispersers than the scrub-breeding birds (Crooks et al., unpublished data), a wide range of native plants (Alberts et al. 1993), rodents (Bolger et al. 1997*b*), invertebrates (Suarez et al. 1998; Bolger et al. 2000), and mammalian carnivores (Crooks & Soulé 1999). The persistence of these native populations in the urbanizing landscape depends on the persistence of the fragments themselves.

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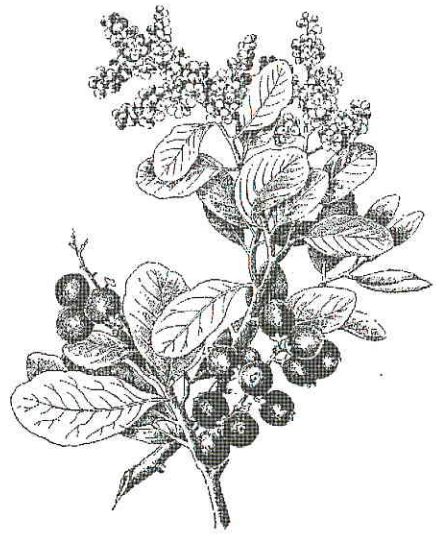

PUBLIC SCOPING MEETING

CALIFORNIA HIGH-SPEED TRAIN SYSTEM

LOS ANGELES TO SAN DIEGO VIA THE INLAND EMPIRE

THURSDAY OCTOBER 22, 2009

3:00 P.M. TO 7:00 P.M.

HELD AT

CESAR CHAVEZ COMMUNITY CENTER

2060 UNIVERSITY AVENUE

RIVERSIDE, CALIFORNIA

Pages 1 - 5

Comments by:

1. Judy Salazar
2. Steve Enna
3. Ned Ibrahim

RIVERSIDE, CALIFORNIA, THURSDAY OCTOBER 22, 2009,

MS. SALAZAR: I just want to say that the meeting is very interesting. I have been reading about it in the paper and following through with it. Resident of Riverside all my life. I would like to see it go along the corridor of the 215 free way. I prefer the 215.

MR. ENNA: Here are my comments on it.

Number 1, you're going to have to limit the stations. Otherwise you might as well build a Metrolink, because the whole purpose of a high-speed train is to have limited access so that you can go faster.

Second thing is if you do that, then you have to have light rail and buses to augment it so you can get the people from and to the high-speed train.

And third, I like the 215 option. It makes more sense: Easier to construct; the land is not impacted; there's a lot of open space. And it will be easier to control.

MR. IBRAHIM: I live in Riverside. I am a retired engineer. Was the Assistant Public Works Director for the City of Corona.

Obviously this is a tremendously important project for the State and for the region. Just looking

at the maps here without looking at all the details, because there are no details, the purple alignment, which is the I-10/215, the one that is through East Riverside seems to be positioned to serve where the most concentration of population and commerce and future growth for the western Riverside County is, and that would be my choice, without looking at the rest of the facts of course.

The station near UCR, in addition to the one by Cal Poly Pomona, are really critical. These are huge campuses, and obviously this kind of facility being a high speed facility, should really be looked at as an Interstate, as if it was a freeway. There shouldn't be too many stops. Otherwise it ceases to be an intrastate system. You cannot have a stop in every little town.

And certainly there would be opportunities. It's like when you build a new freeway. There will be opportunities to feed into the system through light rail or Metrolink in addition to the highway system.

But I am for the purple alignment that seems to be just positioned exactly where I think it needs to be in relation to the freeway system and the population, where the growth is for the County.

(end of comments)

STATE OF CALIFORNIA)
) ss.
COUNTY OF LOS ANGELES)

I, RUBEN GARCIA, CSR No. 11305, do hereby certify:

That the Transcript of Proceedings was taken down by me in shorthand at the time and place therein named, at which times the witnesses were placed under oath and were sworn by me to tell the truth, the whole truth, and nothing but the truth;

That the foregoing pages contain a full, true and accurate record of all proceedings and testimony to the best of my skill and ability.

I further certify that I am neither counsel for any party in said action, nor am I related to any party to said action, nor am I in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 30th day of October, 2009.

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RUBEN GARCIA, CSR No. 11305